American Machinist

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Rotor Brief for the American Machinist Awards for 1931

In meeting the various problems of equipment replacement, Rotor Air Tool Company proceeds on the theory that small organizations have definite advantages over large. With closer contacts between management and workers, fewer specialized management functions, and more centralized executive control, this forward-looking company has worked out an exceedingly broad and workable equipment replacement policy.

On the pages following, D. S. Linton, production manager, discloses this policy, dividing the subject matter into three natural sections:

I. Replacement to cut the cost of machining parts.
II. Replacement to cut time of assembling and testing.
III. Replacement to improve the quality of the product.

Rotor builds portable air tools, such as grinders, buffers, sanders and drills for foundries, automobile plants, tool builders and countless other applications. Parts are produced in lots of 50 to 100 pieces. Tolerances must be close to guard against compressed air leakage; many in fact are confined within 0.0002 to 0.0005 in. Tools in prime condition are thus vital to economical production, and a sound equipment replacement policy becomes anything but a luxury.

Over a period of two and one-half years, during which its policy has been operative, Rotor has trimmed machining costs by 18.6 per cent and has at the same time bettered quality. Assembly costs have been cut an average of 38 per cent in one and one-quarter years. Very logically the management has even extended the policy beyond machine tools to jigs, fixtures, assembly benches and even to office equipment. Every man who played a part is to be congratulated.

It will not be forgotten that the Committee on Awards recommended and urged the publication in alphabetical order of all eight finalist briefs for the *AM* Awards. This issue completes the carrying out of the recommendation. Each brief has its place in the scheme of things. The editors of *American Machinist* submit that the machinery and metalworking industry has been genuinely enriched thereby.

Diversified Replacement In a Small Plant

Typical parts for some of the 24 models of Rotor air tools, most of them produced in lots of 50-100

MACHINING costs were cut 18.6 per cent in 2½ years, assembly costs 38 per cent in half that time and quality was improved as a result of the thoroughgoing replacement policy adopted by The Rotor Air Tool Company. In the "small" or "medium-size" plant classification, its policy—covering tools, jigs and fixtures, even office equipment—will be found readily adaptable to a great many plants*

D. S. LINTON
Production Manager,
The Rotor Air Tool Company

THIS brief is entered in Class II of the *American Machinist* contest. We feel that concerns in this group of smaller companies have certain advantages over the larger ones in meeting the problems of replacement. There is a closer direct contact between the management and the shop force. The person in charge of production in a medium-size company is directly responsible for machining, assembly, changes in designs to facilitate machining, tooling to reduce cost and improve quality, inspection, testing and the purchase of new equipment; while in the larger organization, these duties may be under seven or eight different heads. This concentration in one person results in better coordination in solving these problems, and the person in charge of production needs only the approval of one executive to carry out his policies.

While it might be assumed that the larger concern would have certain advantages in the volume of their product, the size of the lots of specific pieces in a medium-size concern is usually as great as in the larger companies. In presenting this entry in the contest, therefore, we believe that the medium-size concern can accomplish as much or possibly more than the larger one in the way of a proper replacement policy. The total dollars saved by the smaller company may not compare favorably with the total dollars saved by the larger organization, but on the basis of a percentage of profit the medium-size concern may show better results than the larger one.

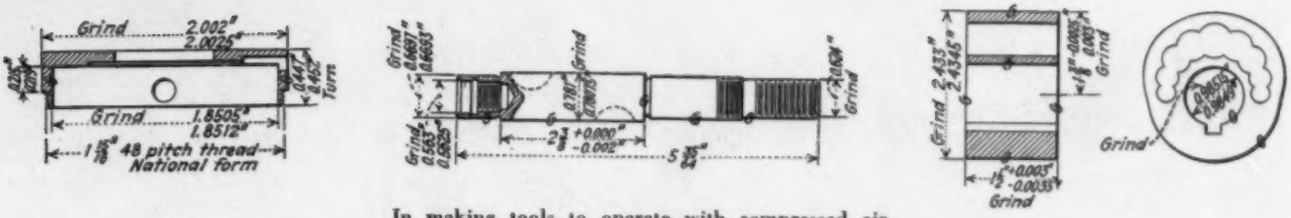
Our Replacement Problems

The manufacturing operations of The Rotor Air Tool Company consist of the production of portable air tools of the rotor type, such as grinders, buffers, sanders and drills. The production requirements for the 24 different models vary with the sales, which in turn fluctuate with conditions in the various industries, such as foundries, automobile plants, machine-tool manufacturers, outside contractors, etc.

Parts for the standard models are, therefore, made in lots of 50 to 100 pieces, with some lots of interchangeable parts running as high as 500 pieces. Parts for the semi-standard models are produced in lots of 10 to 25 pieces, while the assembly of sub-units and complete machines runs in lots of 10 to 50.

In addition, the tolerance of parts must be maintained within close limits, not only to allow for absolute interchangeability but to maintain the standards required of these parts in the finished machines. Our product,

*Brief entered for the *American Machinist* Award for 1931, Class II, and selected by the Committee on Awards for special consideration and publication. This brief completes the series.



In making tools to operate with compressed air, close limits are essential. A center cell, a spindle and a rotor, showing the machining tolerances, some ranging from 0.0002 to 0.0005 in.

portable air tools, is built around the Rotor type of air motor. Since compressed air tends to leak very rapidly through small openings, the limits of all moving parts in the motors must be maintained, the limits ranging from 0.0002 to 0.0005 in. This requires first-class machine-tool equipment and many jigs and fixtures, regardless of the fact that the quantities made would not ordinarily justify the expense of such productive equipment.

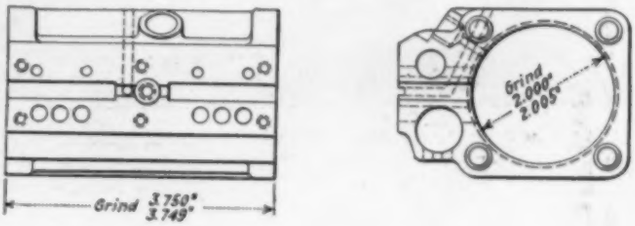
Statement of Rotor Replacement Policy

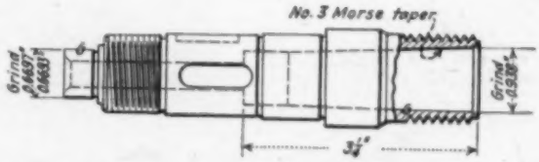
The Rotor Replacement Policy may be outlined as follows:

1. Buy new machine-tool equipment where the period of repayment is four years or less.
2. Replace productive equipment, such as tools, jigs and fixtures, where the period of self-payment is two years or less.

Heald "Sizematic" grinder that replaced two internal grinders to hold limits of 0.00025-0.0005 and reduce grinding time an average of 3 min. per piece. It paid for itself in 2.9 years

3. Improve assembly conditions wherever possible on the general assumption that first-class working conditions always pay.
4. Buy new machine-tool equipment or tools and fixtures whenever necessary to improve the quality of the product, justifying the purchase on the increased volume of sales rather than on the direct saving.





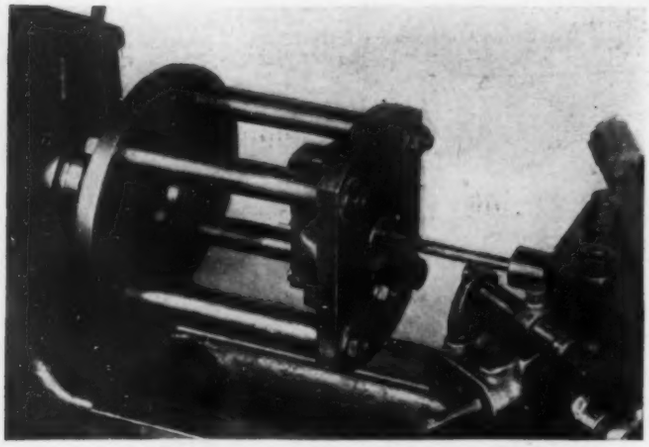
Two typical examples of time reduction that resulted from the purchase of a Heald "Sizematic." The cylinder (above) took 7.8 min. to grind, now takes 3.7 min., saving 4.1 min. The drill spindle took 7.2 min., now takes 5.3 min., saving 1.9 min.

Section I—Replacement to Cut Machining Costs

A Heald Sizematic replaced two Heald internal grinders on the internal grinding of holes $\frac{9}{16}$ in. in diameter to 4 in. in diameter on such work as cylinder bores, gears, rotor bores, governor-sleeve gears, etc., which are held to limits of 0.00025 to 0.0005. The advantages of the new machine over the old are increased spindle traverse speed due to hydraulic feed, increased power and rigidity, and reduced gaging time due to the sizing feature. On the old machine the wheel was dressed by hand, while on the new the wheel is dressed automatically. The "Sizematic" feature has reduced the necessity for gaging these parts as many times during the grinding of one hole. Since the average length of operation per piece on this class of work is from five to ten minutes, this amounts to a real saving.

Two typical examples of reduction in time are shown. The average reduction on a variety of work was 3 min. per piece. The shop cost for labor and overhead is $0.03 per min. The self-payment time was figured as follows:

Saving per piece, 3 min. × 3c. per min.	$0.09
Yearly saving in all work, 20,000 pieces per year × $0.09 = Saving of	$1,800.00



A new jig for a turret lathe, which reduced machining time on a governor cap 3.6 min., to pay for itself in six months

The aluminum governor cap which, when chucked, was distorted, but which now is held in the jig shown. Rotor jigs must pay for themselves in two years

The new machine cost	$6,315.00
While the old was worth	1,000.00
Making the replacement cost	$5,315.00

The self-payment time was

$$\frac{\$5{,}315.00}{\$1{,}800.00} = 2.9 \text{ years}$$

The Heald "Sizematic" paid for itself in 2.9 years, while the depreciation on this type of equipment is 10 per cent or on a ten-year basis. This met our policy of replacement on a four-year basis, and in addition to the certain financial return of this replacement, there is an intangible dollar value due to the better quality of work produced on the new machine.

Replacement of Jigs and Fixtures

The cost of jigs and fixtures is a substantial item in a medium-size shop when this cost is figured in terms of cost per piece. A large amount of tooling is necessary to turn out the parts within the requirements of tolerance and interchangeability. When the replacement of jigs and fixtures which already meet these requirements is considered, the new equipment must pay for itself within two years or less, since the depreciation rate for this type of equipment is 50 per cent.

Here is an example of replacement of old fixtures with new on this basis.

The first operation on the aluminum governor cap shown was formerly done on a turret lathe with special jaws in a two-jaw chuck. Considerable difficulty was experienced in getting a round plug gage hole. The holes would be satisfactory when the piece was in the chuck but on removal the distortion caused by the chuck jaws would make the hole egg-shaped. A good deal of time and care was required by the turret lathe operator to produce pieces which could be used.

A preliminary disk-grinding operation on the face was, therefore, made and a new turret-lathe fixture, developed. By utilizing part of the old fixture, the cost of the new fixture was held to $35. In the new fixture, the piece was held against the disked face instead of between chuck jaws; this prevented distortion, required less attention from the operator and allowed for higher speeds and feeds. The time per piece was reduced 3.6 min.

The saving per piece was 3.6 min. × 3c. or 10.8c.
The cost of the fixture was $35.
To pay for the fixture required:

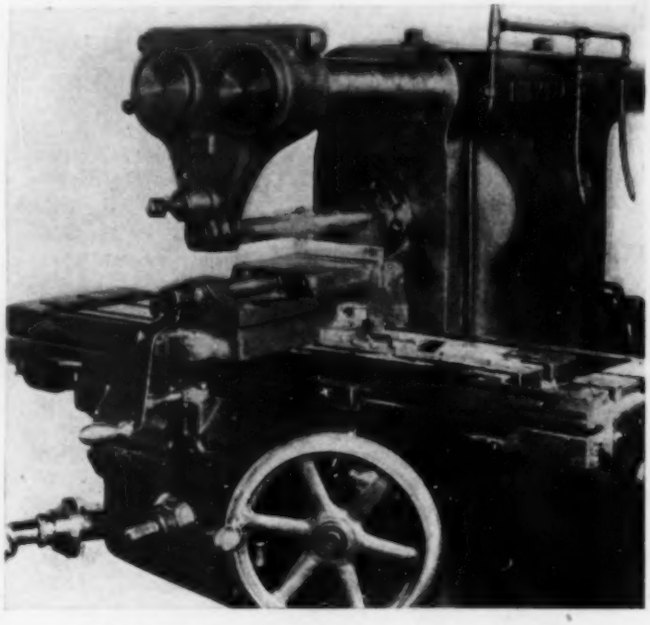
$$\frac{\$35}{10.8\text{c.}} = 324 \text{ pieces.}$$

Production requirements provided 324 pieces in less than six months, so the replacement was made. While the amount of saving involved in this example is perhaps small, it is representative of many similar chances for replacement of productive equipment and the total savings of this sort have actually been substantial in our case.

Replacement to Cut the Cost of Outside Purchases

A Kearney & Trecker No. 1 manufacturing milling machine was installed for the production of blades which are cut from ¼-in. thick fiber stock coming in sheets 23x35 in. Ten different sizes of blades are made. These blades were formerly bought outside. The results of making these blades in our own plant were as follows:

The number of milling operations was cut from four to three because of the accuracy of the new machine as compared to the older and larger machine formerly used outside.



Kearney & Trecker manufacturing miller installed to produce rotor blades from ¼-in. fiber. It paid for itself in 1½ years and cut blade cost 50 per cent

A section of the assembly department, showing the individual worktables at right angles to the windows, with parts brought up on bench-high wheel trays

The time per blade was cut 20 per cent by better workmanship and better supervision.

The overhead rate was cut 10 per cent.

The profit of the supplier was eliminated.

The total result was a reduction in cost per blade of 50 per cent. In addition, we now control our inventory of finished blades, thus in turn reducing the average inventory and at the same time avoiding shortages which previously occurred. The savings per year amounted to $1,250, so that we paid for the machine in:

$$\frac{\$1{,}953.00,\text{ the Cost of Replacement}}{\$1{,}250.00,\text{ the Saving}} = 1\tfrac{1}{2}\text{ years.}$$

on this item alone.

We found, moreover, that some other work could be done to advantage on this machine, although even with this the machine is not kept busy all of the time.

Summary

Machining costs have been cut 18.6 per cent in a 2½-year period as a result of this program. During this time many changes in machining methods occurred which increased the time of individual parts in order to improve quality, but in the 18.6 per cent is the net average saving.

Furthermore, we believe that the former methods were not by any means poor or inefficient and in fact probably were better than average practice.

Section II–Replacement to Cut the Cost of Assembly and Testing

At this point in the replacement program, definite results were apparent in assembly operations. The improvement of quality in the machining of parts had eliminated, to a large extent, filing and fitting in assembling but there still existed an opportunity to cut assembly cost by improving the facilities of assembly.

This operation was formerly handled on long tables facing the windows. The parts for assembly were carried in stationary racks 15 ft. back of the benches, and testing, with the accompanying noise and confusion, was done with prony brakes in the open next to the assembly benches.

New individual benches were installed at right angles to the windows, giving better light. Parts were supplied from stock on wheel trays which carried the exact quantity needed for the entire lot. This wheel tray may be moved against the end of the work bench, avoiding walking back and forth for parts, and the tray itself may be moved on its wheel support to the drill press or arbor press. The testing has been segregated in a room made sound-proof with Johns-Manville accoustical treatment, which keeps all noise and confusion away from the assembly floor.

A dynamometer has replaced the prony brake method of testing. This consists of a dynamo which is operated by the air tool under test. The resistance of the dynamometer gives the direct reading of horsepower on a wattmeter so that a horsepower test can be made in half the time formerly necessary.

The resulting horsepower test is accurate, and the dynamometer has a further advantage in furnishing complete horsepower curves on experimental machines quickly. When production is at peak, the restriction which formerly occurred in the test room is avoided, since the output of the test room is increased 50 per cent with the dynamometer. The cost of this improvement was only $300 because of the use of welding for the frame work of the dynamometer and because of the purchase of a rheostat and dynamo which had been ordered by another concern and cancelled.

Even small items were studied for a replacement saving. In our class of product, which is assembled in lots of 10 to 50, there are many small parts such as screws, bolts, nuts, lock washers and blades. It is essential for cost records that these parts be counted when received for stock and issued for assembly. The stockroom man was spending considerable time counting these small items and the amount of work involved in this

counting caused delays in getting material ready for the assembly floor.

We, therefore, purchased a small Toledo counting scale at a cost of $175. This saved one hour per day, which we figured at $0.60 per hour because the stockroom man is himself a part of the overhead expense.

The saving was, therefore, only $0.60 per day, but the self-payment period was:

$$\frac{\$175}{60c.} = 290 \text{ days or } 13 \text{ working months.}$$

The replacement of such items of non-productive equipment is often more profitable than first estimated. For example, the installation of a used Elliott-Fisher bookkeeping machine, which cost $1,500, has paid for itself under actual conditions in 2½ years. The machine handles a variety of bookkeeping work and not only saves considerable time but permits the use of less expensive types of office help for its operation.

Summary

Assembly costs have been cut on the average 38 per cent as a result of the machining replacements which affected assembly, and as a result of the improvement in facilities for assembly which are outlined in this chapter. This was accomplished within a year and a quarter.

Section III—Replacement to Improve the Quality of the Product

In our experience a very profitable type of replacement is to purchase machinery or productive equipment which will improve the quality of the product, that is either improve the production performance of our air tools in the customer's plant, or reduce the customer's maintenance cost. Such purchases of equipment are often difficult to justify on any self-payment basis, although the savings may offset in part at least the investment.

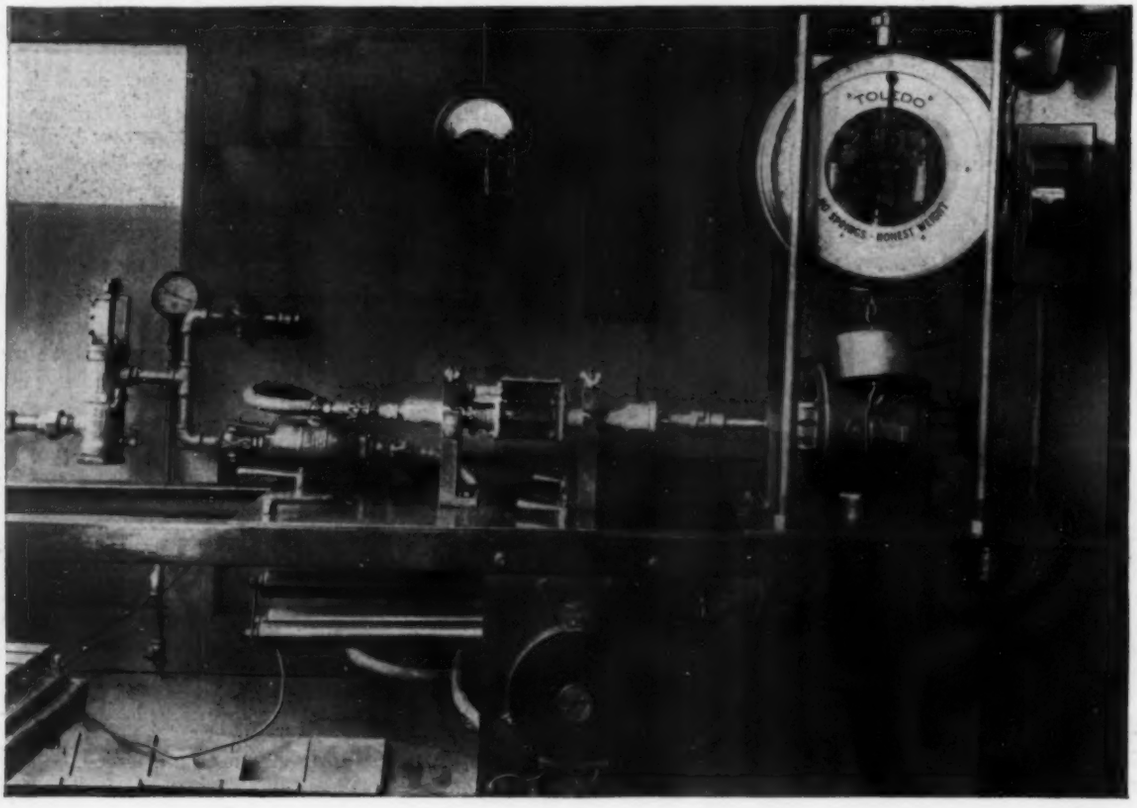
The true profit from this type of replacement comes from the increased sales volume which improvements in quality always bring, and bring with little added sales and administration expense. "Marginal" or extra business from an improvement in quality or productivity is the volume of sales which is made due to this improvement and which would have been lost to some competitor without the added improvement. This extra volume of sales has entailed little added selling expense and very little additional administrative expense and, hence, is very profitable. It is, therefore, logical to apply part of this added profit to the extra machining or assembly cost which the improvement requires in the shop.

Two examples of this type of replacement will show the operation of this policy.

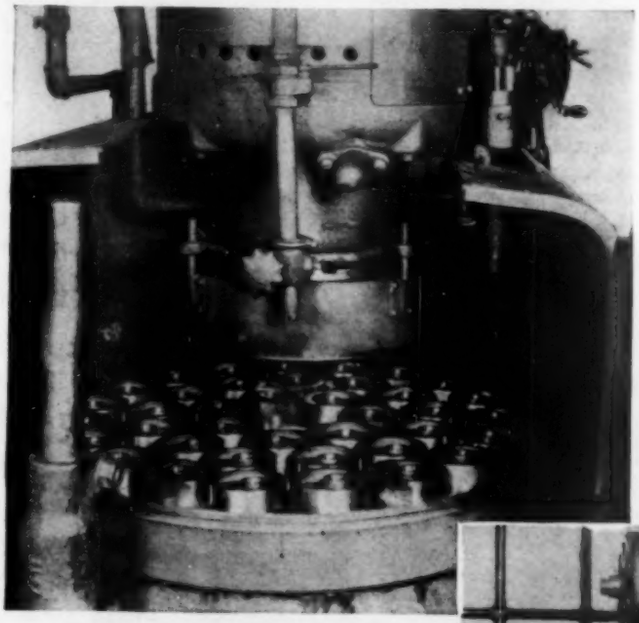
A Replacement Justified Partly by Savings and Partly by Improvement in Quality

The flat surfaces of our rotors, end plates and cylinders were formerly ground on a surface grinder. We wanted to produce a better grinding finish and to maintain closer limits than was practical on the old machine. The work was, therefore, put on a Blanchard 36-in. surface grinder. This gave the desired finish, improving the quality of the product by decreasing air consumption, increasing power and giving better wearing qualities to the product. At the same time, it was possible to work within the limits required with a reduction in time of 30 per cent. The Blanchard cost $5,024, while the old machine was worth only $700, making the cost of the replacement $4,324. It will take 5.7 years to

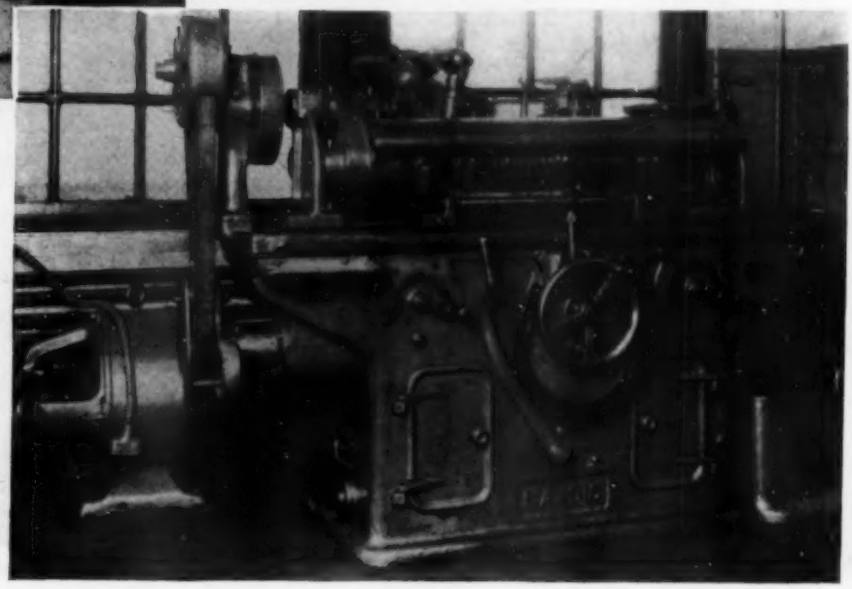
The dynamometer which replaced the former inconvenient prony brake method of testing air tools. It cut time 50 per cent and increased accuracy



Toledo counting scale which saved one hour of the stock keeper's time per day to pay for itself in 13 working months



Blanchard 36-in. surface grinder which grinds flat surfaces to closer limits and aids in increasing customer acceptance of Rotor products. It will pay for itself in 5.7 years at the present rate



Cam-grinding attachment on Landis grinder, one of the purchases necessitated by the change in rotor shape

pay for this machine on the basis of actual yearly average production hours, which we assumed would be less during part of this long period than when the machine was purchased because of the inevitable drop in business conditions. While our policy is to purchase on a four-year basis and most of the chances for replacement will meet this standard, at the same time we feel that with a 10 per cent depreciation rate it certainly pays to replace on a 5.7-year basis when other advantages, such as quality, are introduced in the situation.

A Replacement Justified Only by Improvement in Quality

It was proposed to change the rotors on one machine from the round type to the oblong type. This change in design gave increased horsepower to the air motors and provided this increased power at a higher r.p.m. With any type of portable grinder, the higher the r.p.m. at which maximum horsepower is developed, the greater will be the productive output of the grinder. (The free r.p.m. must of course be kept within the Safety Code limits for the particular type of wheel.)

Outside metal removal tests on experimental models showed that over-all production output of the tool with the new type of rotors was increased 17 per cent.

This change required the purchase of a special table for a spline miller, tools for gear shaper and a cam-grinding attachment for the Landis grinder, involving a replacement expenditure of $1,600. In addition, the total cost of machining the new rotor was increased 32 per cent.

The question, therefore, arose on the part of the shop

The change in rotor shape from round to oblong which required the purchase of $1,600 worth of special tools to machine it, at an increased cost of 32 per cent. It improved air tool operation 17 per cent, thus was justified

executives, "Will the improvement in quality of the finished product justify this increase in shop cost and this investment in shop equipment?"

The real answer to this problem of replacement lies in our customer's point of view. Will the improvement in the quality of the Rotor Air Tool justify replacement by the customer in his plant? The average customer figures out the value of a 17 per cent increase in production from an air grinder thus:

The cost to the customer for operating a grinder is:

Labor per hour	$0.50
Overhead per hour	0.50
Total	$1.00

The actual saving is:
17 per cent of $1.00 per hour ... 17c.

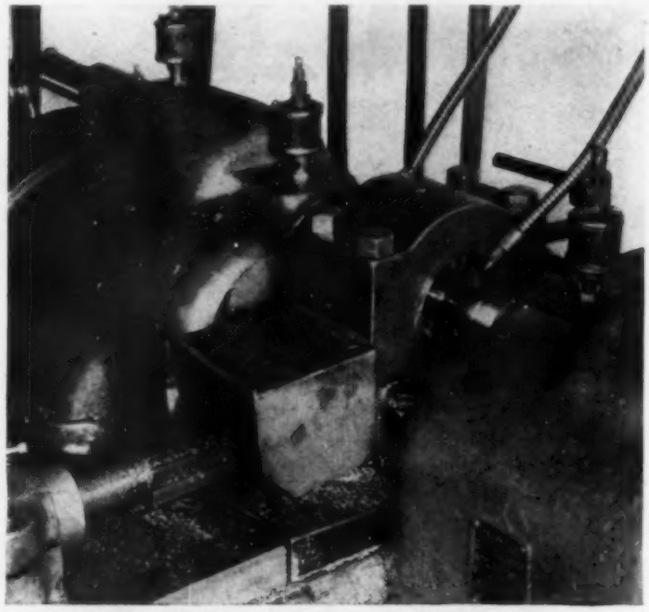
The grinder is in operation about 6 hours per day, so the saving per day is ..... 6 × $0.17 = $1.02

The self-payment period is:

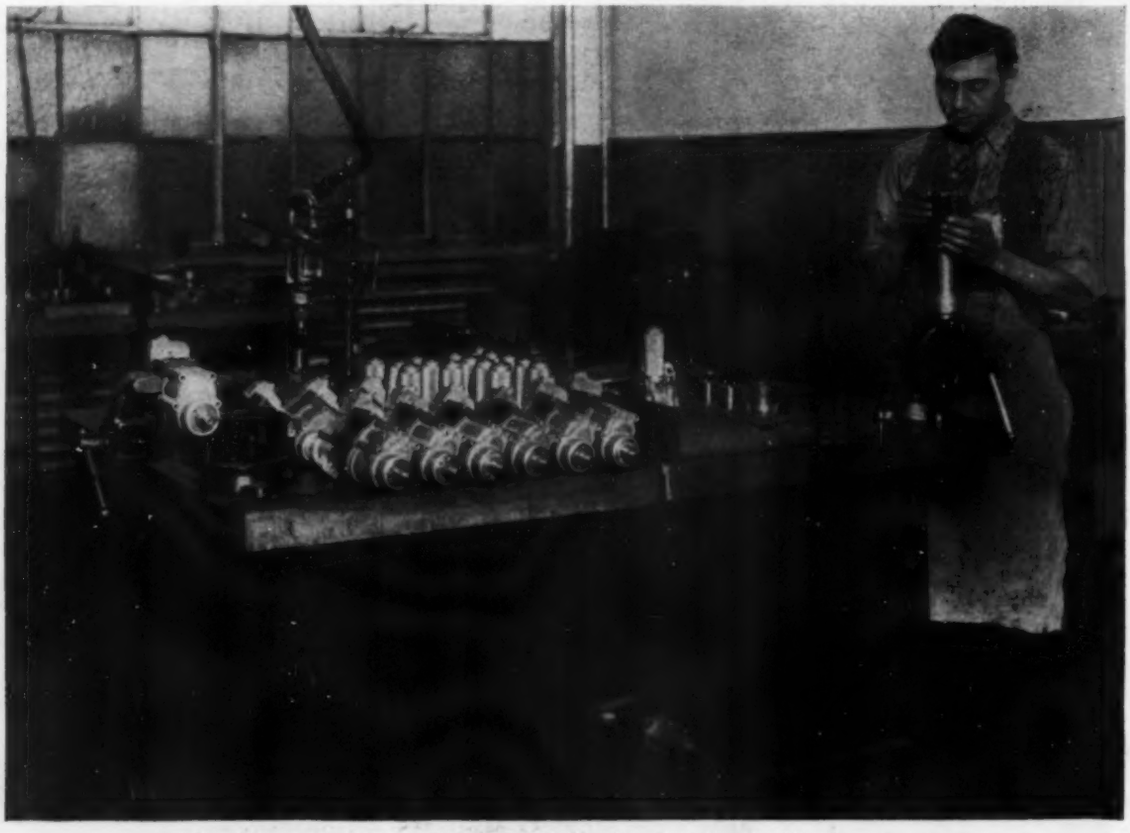
$$\frac{\$120,\text{ the Price of the New Grinder}}{\$1.02,\text{ the Daily Saving}} = 120 \text{ working days.}$$

Since customers in general will replace their portable tool equipment on the basis of self-payment in one year or less, this improvement due to change of rotors is obviously of definite value to the customer, and over a period of time we can expect increased business from the change. We have selected this illustration of an improvement which developed a relatively small increase in productivity of our product, in order to emphasize how quickly small improvements in production will justify replacement by the customer when the amount of the investment, in this case $120, is small.

If our customer were required to purchase a machine tool costing two to three thousand dollars to make a 17 per cent saving, it is questionable whether the improvement would appear worthwhile to the customer, but when the amount of cash involved in the purchase is $120, the replacement is immediately justified.



Special table for Pratt & Whitney spline miller, another of the purchases made necessary by the change in rotor shape



Another view of the individual work benches in the assembly department

The purchase of the table for the spline miller, tools for the gear shaper and the cam-grinding attachment for the Landis grinder amounting to $1,600 was, therefore, approved by the executive, although from a shop point of view the replacement was clearly impossible to justify on a self-payment basis. We believe that our point of view in this respect is thoroughly sound, and that this attitude of mind should be given careful thought by shop executives in medium-size plants in considering their replacement problems. The quickest and surest way to increase the volume of sales is through improvement of the product, and unless the indirect but certain effect of such improvements on the volume of sales are considered by the shop executives many items of replacement may be side-tracked through failure to appreviate this point.

Summary of Results

1. Machining costs have been cut 18.6 per cent in a 2½-year period.
2. Assembly costs have been cut 38 per cent in a year and a quarter period.
3. The quality of the product has been improved substantially without added charge to the customer.

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Chattering and Tool Life—*Discussion*

DONALD RAEBURN
Glasgow, Scotland

In an article under the title given above (*AM*—Vol. 75, page 306), J. T. Towlson relates his experience in boring a steam engine cylinder, using a good automatic-feed boring bar in which the tools were supported in the boring head by wood packing. By this method, well finished, round cylinder bores can be produced.

One cause of chattering is the setting of the cutters radially. Where the metal is hard and the depth of cut is not uniform, cutters so set have a tendency to spring forward and deeper into the cut, causing chatter. Setting the cutters back of a radial line, and parallel thereto, gives what may be called a trailing action. Resulting from this setting, the cutters are inclined to yield backward instead of springing forward, and thus prevent chatter. As far as can be observed, chattering of the cutters produces a rough, corrugated surface in the work, and the action can be described as the cutters being caught by the work, drawn in and cutting deeply. This springing can take either a forward or a sidewise course, dependent either upon the feed mechanism used or the setting of the cutters.

When the cutters have sprung to a certain depth, the work, the cutters, and the machine elements are placed under a strain that causes them to spring apart. These movements taking place in quick succession and more or less regularly, produce a noise that is discordant to the machinist, and a surface that is pitted. The theory of a metal-cutting tool is that it is a wedge of correct form and strength, the cutting edge of which when correctly presented to, and traversed on the work, will sever the metal with a shearing action and cause it to flow over the top of the tool, with a minimum of heat.

Under the conditions described by Mr. Towlson, the cutters, though of perfectly correct form and correctly presented to the work, were unable to perform their proper duties with a shearing action. Owing to the inability of the belt to give a steady and constant drive, cutting was performed in an intermittent manner, caused by the sudden increase and decrease in the tension of the belt. Excessive heat was also caused at the cutting edges of the cutters by the more or less acceleration of the cutting speed. The cutting action of the cutters under these conditions ceases to be a shearing action, becoming a continuous succession of hammering blows which chip off the metal in a way that is detrimental to the cutters.

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Salvaging Worn Bushings

F. W. CHEATHAM
Proprietor, Acme Machine Works

We have successfully used the method here described for salvaging worn bushings. In maintenance and repair work, we frequently come across bronze bushings that are badly worn, and which would ordinarily be replaced by new ones. We salvage the bushings by placing the part containing them in a hydraulic press with the under sides of the bushing resting firmly on the table. End-wise pressure is applied, upsetting the bushings and closing them in. Since the bushings are closely bound by the holes they are in, there is no other place for the upset metal to go but inward.

After the operation, the bushings are reamed to the correct size. The slight shortening of the bushings is not usually of consequence when the cost of replacement is considered. Frequently, as in the wristpin ends of connecting rods of internal combustion engines, the bushings are longer than the thickness of the rod ends and making them a little shorter does not matter.

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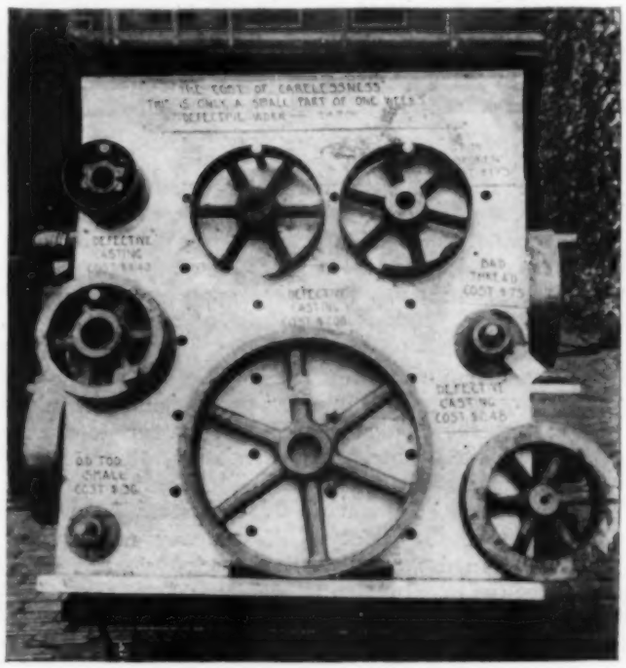
The Cost of Carelessness

"The cost of carelessness"—$47.01 in one week. This exhibit of defective parts placed in the front yard of a well-known manufacturer of transmission equipment calls vivid attention of workers and supervisors to the errors and how they occurred.



EXECUTIVE

Hand to Mouth

Buying only for current requirements is the policy now being followed in most lines of business. Inventories are critically scrutinized and have been reduced where at all possible. During the period of taking up the slack, curtailment of purchases undoubtedly resulted in hardship for suppliers of industrial goods. The so-called hand-to-mouth policy has been deplored in many quarters. But now that the deflation has run its course, do you believe the process has been wholesome or otherwise? Do small-lot purchases result in waste in the plant of the supplier? Or is business in general in a better strategic position because of its reduction of unwieldy inventories? What do you think about this problem?

FRANK LYON, Salesmanager of the Mechanical Bearing Company, had very strong convictions as to what was wrong with the world in general and business in particular. But these opinions were not reached without constructive thinking based on his personal experience. Although Bill Holland did not always agree with Lyon, he enjoyed exchanging ideas with him. Consequently when the two met in the club car on the Cross States Limited, the inevitable friendly argument resulted.

"One of the greatest deterrents to prosperity," said Lyon, "is the present policy, followed by purchasing agents and other business men, of buying in minimum quantities. A few years ago, people bought with an eye to future requirements. But now they look only for a quick turnover."

"What's wrong with that?" asked Bill.

"It's unfair to the manufacturer," said Lyon. "His orders aren't large enough to enable him to plan his production properly. As a result, his manufacturing schedules are erratic, which increases his costs and often works a hardship on his employees."

"But you can't blame a man for refusing to load up with big inventories nowadays," said Bill. "It's to the advantage of any business to keep its assets as liquid as possible. Styles are changing rapidly, and improved products are developed almost daily. A business that is not in a position to change its designs quickly is in danger of falling behind the procession."

"I'm not advocating that anyone load up with large quantities of slow moving materials," said Lyon. "But executives today are curtailing their purchases to an extreme degree. The result has been a twofold slowing up in the volume of trade—first, from the general business recession, and second from the reduction of stock on hand."

"No doubt the cutting down of large inventories was a handicap to sales a year ago," said Bill. "But today these are for the most part deflated to rock bottom. After all, this is a wholesome condition because it means that any increase in demand will be quickly felt all along the line."

"In the meanwhile, the manufacturer suffers through being forced to produce in uneconomic lots," said Lyon. "Customers are demanding even shorter deliveries than in the past and apparently expect the supplier to carry their stock for them. They are simply trying to pass the buck."

"When inventories are stabilized," said Bill, "a company's purchases will be in direct proportion to its sales. In the past, the tremendous cost of excess stock was often overlooked. Storage, depreciation, obsolescence, handling, and interest charges all exacted their toll. They constituted a form of waste just as serious as manufacturing inefficiency. A company may suffer just as much from an out-of-date stock system as from the use of old manufacturing equipment."

"A lot of firms have already reduced their inventories to the danger point," said Lyon. "They are not in a position to quote quick deliveries on large orders. Now that competition is keener than ever, customers expect quick service. Lack of facilities to supply it, may result in lost orders."

"Overemphasis on service is the cause of much of our trouble," said Bill. "When I see a firm that's stripped for action I feel optimistic about its future. And I'm glad to see so many in exactly that condition today."

FORUM

Discussions Of Former Subjects

Dominant or Dumb?

A conference was called to determine the suitability of a certain type of marcell iron as a regular product for the company to manufacture. Mr. Jones, as we will call him, was demonstrating the proper way to use the article. Mr. Lyon, his immediate subordinate, ventured the information that Mr. Jones was holding the iron upside down. This took of great deal of nerve on the part of Mr. Lyon, as the rest of those present would have been willing to accept this new and novel method as the last word in using marcell irons.

"How do you know that I am holding the iron incorrectly?" bellowed Mr. Jones, at the same time growing purple with rage and affixing a withering stare at poor Mr. Lyon. At this, Mr. Lyon swallowed hard, and only the timely support of an indiscreet assistant chief draftsman saved him from complete ignominy. Whereupon the matter was tabled pending the advice of "someone who knows something about marcell irons," by Mr. Jones, who you may judge, took this course more to save his face than anything else. It would be evident, therefore, that at meetings of this nature a member would think twice before before crossing the opinions of Mr. Jones.

I don't think any worthy associate would judge that his superior got that way by being dumb. That sort of judgment would be more likely to come from the rank and file.

—Ralph M. Gamble,
Jones & Lamson Machine Company.

The Up Grade

It all depends upon what technical training has given Ned Reynolds whether or not he is more desirable for promotion than Jim Boyle. If that indefinable something, we veterans vaguely classify as mechanical horse sense, can be sublimed and directed by a technical schooling then the possibilities of Ned can be likened to the flow of a river—limitless. Of Jim, one might say, his are as a pond of shop methods—useful, but you can trace the bank all around.

If Ned Reynolds would have become a competent engineer without technical training, if he would have dug out and made his own the priceless experience of engineers gone before, then he will eventually become more valuable with his technical training. If he has acquired the fair mastery of higher mathematics, physics, and properties of materials, now offered by any reputable technical school or state university, then he undoubtedly possesses a set of working tools that will give him an advantage over the self-made, comparatively unschooled, mechanic.

I have met and worked with a good many self-made engineers who have never taken a course of study in a technical school. In every instance, I found the really competent engineer to possess the same kind of brain tools as the college man. Often the dogged persistence enabled him to become a better engineer than the college man having less persistence. All other qualities being equal, higher training is an additional asset. Human qualities and personality have a weight all their own.

—C. S. Yont,
Yont Manufacturing Company.

Marking Time

While a most conservative policy regarding business expansion is unfortunately being pursued as a general rule at the moment, there are signs that the doldrums will soon be dispelled. When the looked-for revival appears, some of the too conservative gentlemen are going to be left at the post. I have in mind a medium-sized concern during the dark days of 1920-21. While that depression had been running its course, it had been improving its original designs and was all set to go into production at the first sight of a rift in the gloomy business horizon. A rival concern, working quietly and unostentationsly along the same lines, decided to take the risk the other people had refused, with the result that when the upturn came three months later, it rode the wave.

It is very significant that today the waiting policy of the first concern has been discarded, and it is now in the market with an improved product which is enjoying modest success.

—Robert S. Alexander,
Universal Winding Company.

Shifting the Burden

Multiple-shift operation employs a larger number of men, and utilizes machinery to its limit. This benefits a number of persons, not only in the operation of machines, but in the increased number used, their maintenance, repair, and replacement.

The disadvantages are not difficult to overcome, but will require alteration in plant and equipment to meet the new conditions. There would not be any relief for machinery or fixtures through rest; all service departments would have to operate continuously. Maintenance cost would increase, although this should not be any greater in proportion to production. Many machines would have to be redesigned.

The greatest changes would be in lighting systems, as in most plants, these are at present only supplementary to daylight. For efficient operation in hours of darkness, these systems would have to be supplemented. This is where the new windowless factories would fit in, being designed to be at all times independent of daylight, and having constant visibility. The unnatural operation in dark periods would be overcome in time through adjustment of the employee's point of view. Employment's dependence on this adjustment would eventually outweigh any objections. Twenty-four hour operation is accepted in many lines.

—John S. Isdale, *Plant Engineer, International Silver Company.*

Iron and Gold

To distribute administration, engineering, and selling expense on a flat percentage basis over the shop and foundry alike is not a desirable accounting method. The foundry being a part of the organization should be charged with its part of the administrative expense; but engineering, when not for the specific purpose of improving the foundry methods, should be charged directly against the general manufacturing account. Special patterns should be charged to a specific order, and stock patterns should be charged to future orders. To charge the time for changing experimental patterns, and the

engineering department's development expense against the foundry is not an accurate method of determining foundry costs.

It is quite fair to the foundry to charge part of the productive selling expense against it; but the unproductive selling expense ought not to be charged against the foundry, in the same way as the foundry does not charge part of the cost of scrap and bad castings against the sales department. —NILS H. LOU.

One Line or Many?

A manufacturer of machinery would do well to stick to his line under present conditions. A firm manufacturing a small tool under present conditions is forced to reduce sales cost by adding to the line.

Assuming that a firm possesses sufficient reserve capital to add a new machine or tool to its line of manufacture, the following questions should be satisfactorily answered before experimental or other work is undertaken:

(a) Is the present article developed and modernized to the fullest?

(b) Does the sales force know the line, and are they covering the field thoroughly?

(c) Can the present article be manufactured and sold at a profit?

(d) What are the future possibilities of the present line?

(e) Is the engineering department capable of designing and developing a new article that would be far superior and more economical than any being made at present?

(f) Would the same amount of capital and energy produce more returns if directed to the old line?

—C. F. STAPLES.

Rainbow's End

The advantages of properly selecting and blending colors used for interior decoration is now well recognized. These advantages should be greater in the workshop where proper coloring, besides improving appearance, makes the shop much lighter. Many shops appear dull and dark because surfaces are left either unpainted or painted a drab color. Some colors soothe, and some irritate. A worker in a shop where everything is drab will tend to become so himself and will not take pride in his machine or work. Anyone would object to a badly decorated office, show room, or home, so why allow workshops to retain their drab appearance? The coloring of a workshop contributes to industrial fatigues. More attention to it would enable a man to do better work and at the same time improve his health. —W. E. WARNER,
Herts, England.

Color schemes are merely another management luxury and are about as important in shop operation as the color of the gas the manager burns in his car. When a plant cannot say, "Here's the job. The piece work price is so much. Now hop to it, and get out all you can because we need them," it is time either to hire new men or to shut down.

A green light whenever practical is easiest on the eyes. This would apply principally to the drafting room and the offices where the greatest percentage of the eye workers are. Any mechanic, worthy of the name, does not have to be given a teaspoonful each of yellow, blue, white, or orange light every hour to turn out a fair day's work. He will overcome or disregard minor obstacles, renew his energy through strengthening vitalizing food and not rely on reflected energizing color vibrations. He will have little time for such theories, but will study out the details of practice in his shop. Color, like welfare, must be overdone to the sickening stage before the 98 per cent dross will be burned away and the two per cent common sense be visible to the general run of plant executives.

—E. E. GAGNON,
Mechanical Superintendent,
Raybestos Manhattan Company.

Itemized Pricing

In all justice to the machinery manufacturer, or any manufacturer of a product that requires engineering effort, demonstrations, and heavy expenditures incurred during installation, the cost of such effort should be borne by the ultimate consumer. It must be recognized that no industry is a philanthropic institution.

Probably the surest and safest way to overcome the difficulties outlined is to segregate the material and installation costs. Thus the customer can purchase a machine either f.o.b. or with an additional erection charge upon delivery, the erection charge being a stipulated sum mentioned in the contract. If the customer feels that his men are qualified to perform the erection and merely require supervision, this supervision could be supplied at a definite rate, allowing reasonable expense and profit.

The question, as to who is to pay for the preliminary engineering work, is one that generally causes the manufacturer the most grief. Most prospective purchasers overlook the fact that the design of machinery for special needs entails the use of highly skilled men and ultimately runs into considerable outlay, even before any actual fabrication begins. If the order fails to materialize, somebody is out of pocket. On standardized machinery, manufactured in quantity, these costs can be absorbed by distribution over a number of machines.

A fair arrangement would be to contract for the engineering work in such way that the prospective customer understood and agreed that this phase of the transaction was his burden whether or not the machine was finally purchased. By this means, the manufacturer would be assured reimbursement whether or not the purchase was actually consummated. —B. HEYMAN,
Chief Draftsman,
Anchor Post Fence Company.

A Dollar Down

There are several reasons why the installment buying of machinery has not become a common practice. On the buyer's side, the principal factors are the lack of financing agencies for this class of business and the high charges made for loans when arangements are made. The manufacturer cannot extend long time credit on a large percentage of his product. Nor does he want the machine back in case a customer fails on payments.

Installment selling would only apply, if used, on strictly standard machines, making it necessary to draw a line as to which machines can be sold by installment. This would be difficult with manufacturers of a diversified line. Installment selling of many articles was the means of building up large voluume and making good profits. There is one point that nearly all such articles have and machine selling does not, that is, being sold locally by an agent who is in business for himself. If machinery could be handled in this manner, then installment selling would increase, but conditions do not point that way.

—L. F. SWENSON,
Industrial Engineer,
Perkins Machine and Gear Company.

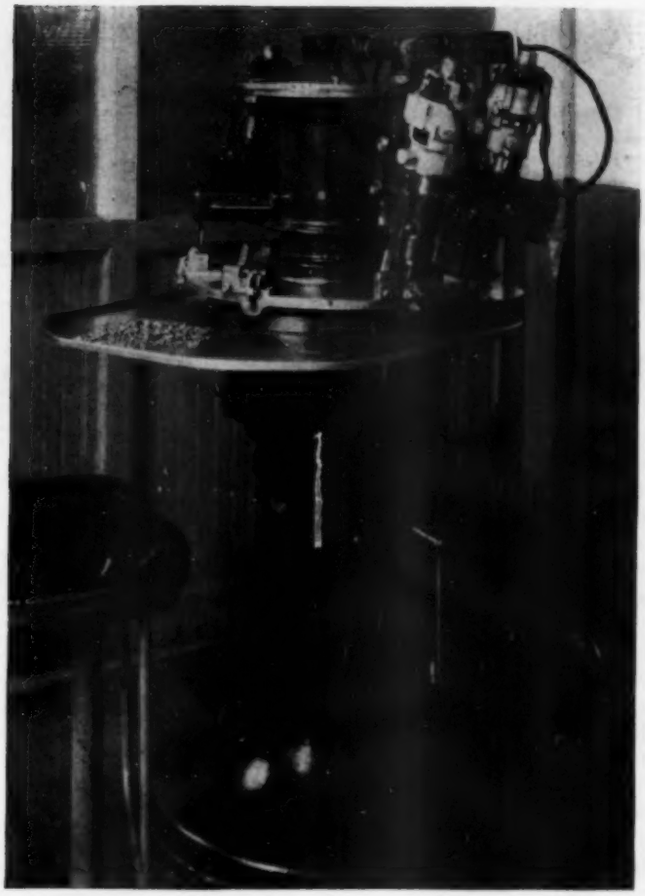


Fig. 1—Because of the large number of parts and the degree of accuracy required, over 90 per cent of the former machining time was saved by this machine

A Special Machine that Paid for Itself

R. E. MC COY

Often standard equipment can be adapted to perform special work. But, there are instances, such as the one described, where an unusual design best fills a particular need

THE four-spindle vertical milling machine described in this article was designed and built for the purpose of taking a light cut of approximately 0.005 to 0.010 in. from the end of each of the fingers of the pawls shown in Fig. 2. When the pawl, having three fingers, is machined, the cutter spindle for machining the fourth cut is not used. Because of the accuracy of the function performed by these pawls, they are held to close limits, the variation being plus or minus 0.001 in.

This machining operation was formerly performed on a small hand-operated bench profiling machine, the pawl being held in an indexing fixture mounted on the table of the machine and indexed by hand after each cut was taken from the fingers. It was a slow and expensive operation, the piecework rate being 98 cents per hundred.

The semi-automatic milling machine, built especially for this purpose, is illustrated in Fig. 1. It has a maximum capacity of 900 pieces per hour, allowing 20 per cent for personal delays, changing cutters, and contingencies. The actual production is about 720 pieces per hour, the piecework rate being 7.6 cents per hundred pieces against the 98 cents per hundred formerly allowed, or a saving in labor cost of approximately 90 cents per hundred. As the usage on these parts is large, the machine paid for itself in considerably less than a year's time. A machine of this type can be readily adapted to a great variety of work that would show a similar saving in labor.

The machine consists of the head *A*, on which the four cutter spindles are mounted, the work table *B*, and the base *C*, on which the control mechanism and the ¼-hp. motor for driving the machine are mounted, as shown in Fig. 3. The four cross-slides *D* are mounted on the head, as shown, to correspond to the angles to be cut on the fingers of the pawls and to the location of the fixtures on the work-table when making the first, second, third, and fourth cuts. The high-speed cutter spindles are of special design, the motors being directly connected to the spindles, making a complete unit in themselves. They are mounted on the cross-slides, as shown, and can be easily moved, up or down as required, by an adjusting nut *E* so as to get any necessary adjustment of the cutter. They are then clamped in position by the hexagon head capscrew *F*. Each spindle or cutter can be easily removed for repairs or replacement without disturbing the set-up of any other spindle.

Each cross-slide has a link *G*, with an elongated slot, pivoted to it by a shoulder screw *H*, to which one end of the lever arm *I* is clamped in the manner shown in Fig. 3. At the same time, this allows a running fit on the clamping stud *J*, which provides any longitudinal adjustment necessary for the setting of the cutter spindles. Thus both vertical and longitudinal adjustment may be quickly made.

The lever arm *I* is pivoted to the head by a shoulder stud *K*, the other end being connected to a finger *L*, on which the roller *M* is mounted by the stud *N*. This roller is in contact with a face cam *O*, mounted on the main drive shaft *P* in the head of the machine, as shown in Fig. 4. As the cam revolves, the lever arm moves the cross-slides, on which the cutter spindles are mounted, across the work, performing the milling operation on the pawl. As the chips are small, a light puff of air, which is released in the unloading position, is sufficient to re-

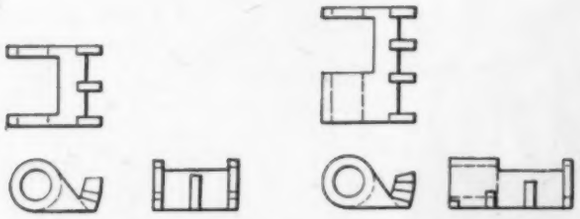


Fig. 2—Pawls of two types were required to be milled to unusually close limits. For these, the special machine was designed

move any that might have a tendency to cling to the locating points on the fixtures.

The work table *B*, Fig. 3, on which six fixtures *Q* for holding the work are mounted so as to permit the operator to load and unload them conveniently, is moved counter-clockwise around the center column *R* under the cutter spindles at the rate of fifteen indexes per minute by a Geneva stop motion *S* keyed to shaft *T*. The ball thrust bearing *U*, around the center column, on which the lower end of the work table rests, reduces the wear to the minimum.

The star-wheel *V*, which is held to the underside of the work table with fillister-head screws, has six slots to correspond to the location of each one of the six fixtures as shown in Figs. 3 and 5. The cam-roller finger *W*, located in the work table as shown in Fig. 3, has a sliding fit on the plunger rod *X* and is kept in contact with the cam *Y* that is fixed to the center column by a spring *Z*. The plunger rod extends out through the edge of the work table and comes in contact with the end of the adjusting screw located in the end of the clamp *A'* for clamping the work in the fixture. This adjusting screw takes care of any slight variation that might occur in the clamp and is set and locked in position by the locknut as shown. As the work table revolves, the work is clamped and released automatically.

The ½-hp. motor, which furnishes the power for driving the feeding and indexing mechanism only, is mounted on the base *C* and is directly connected to a gear reducer having a 50:1 ratio. The starting and stopping of this mechanism is controlled by the foot-operated clutch *B'* which connects the gear reducer with the horizontal shaft *C'* and disconnects this shaft when the foot lever *D'* is compressed.

The bevel pinion *E'* engages the bevel gear *F'* fixed to the vertical shaft *T* which has the Geneva stop motion mounted on the upper end and a pinion *G'* fixed to the lower end as shown in Fig. 3. This pinion engages the large gear *H'*, fixed to the lower end of the vertical shaft that extends up through the center of the machine, and has a cam *O* for feeding the cutters over the work fixed to the upper end. Thus both the table indexing and cutter feed are operated by a single motor.

The table indexes at the rate of fifteen indexes per minute or once in every four seconds divided as follows: stationary time 2.667 seconds, which is ample time for the operator to load the fixture as all that is necessary for her to do is to place the part in the fixture and

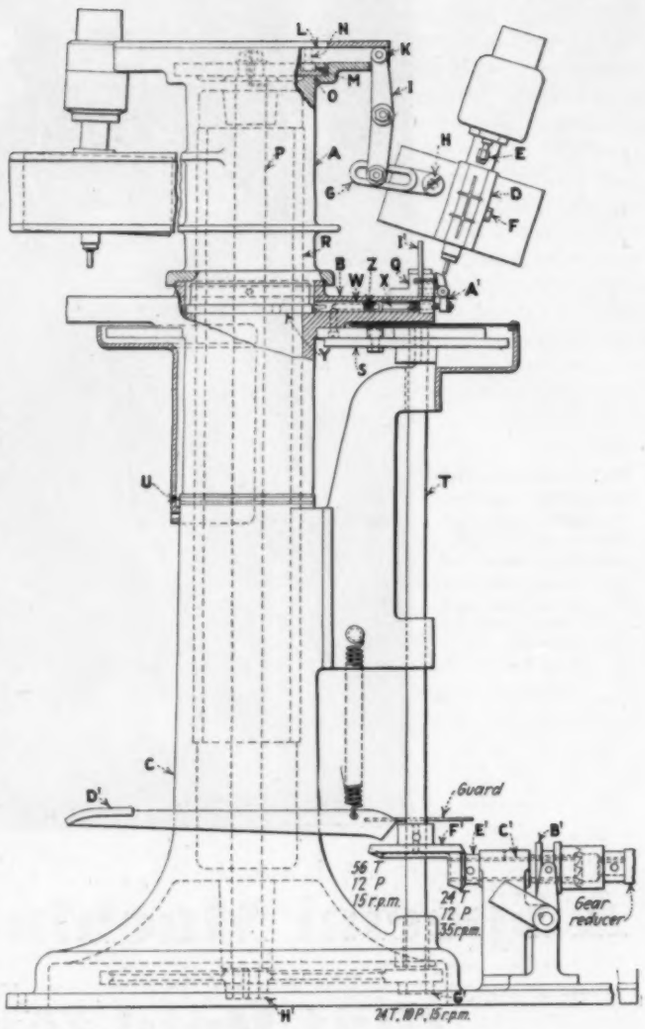


Fig. 3—The work table is indexed by means of a Geneva stop motion and a six-pointed star wheel

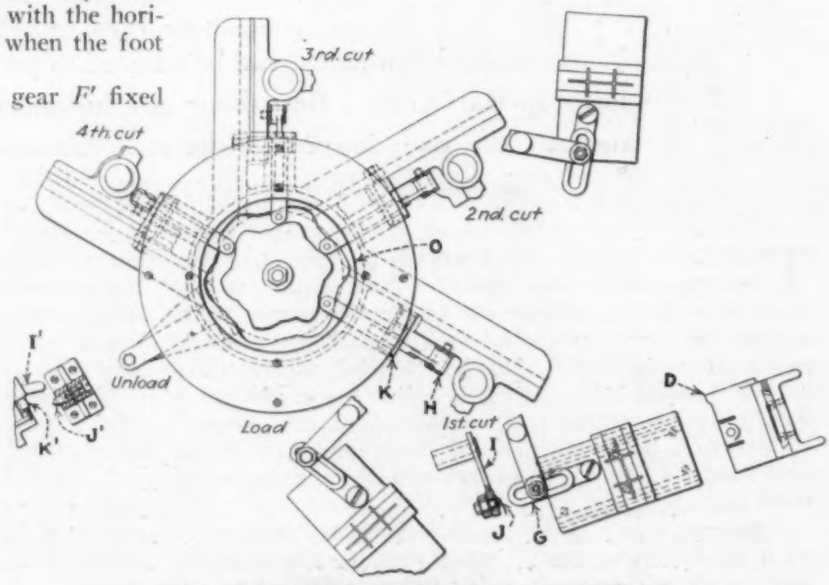


Fig. 4—Four independently driven cutter heads are fed across the work by a central cam operating through adjustable link motions

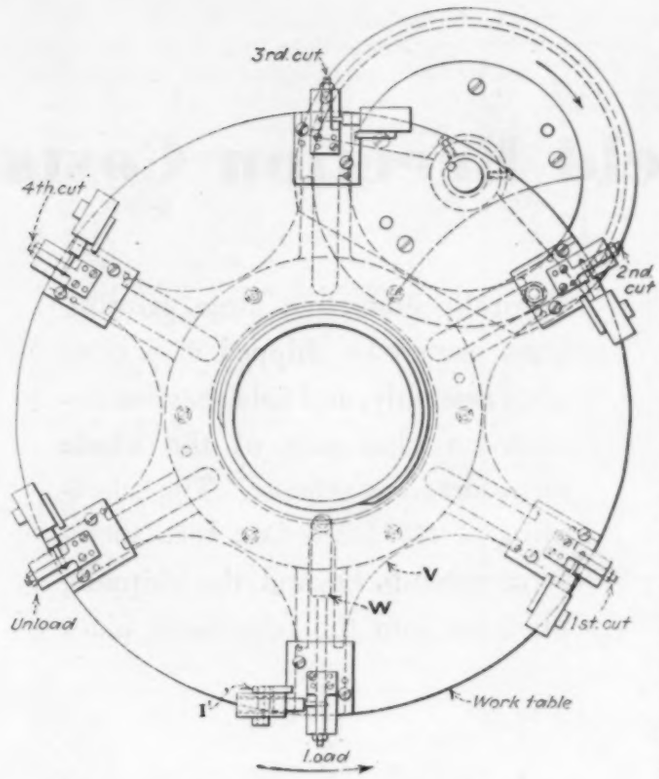


Fig. 5—The work is indexed to six stations at the rate of fifteen indexes per minute. A blast of air unloads the fixtures and clears away the chips

shove the lever *I'*, which operates the locating pin *K'*, forward; and the indexing time of 1.33 seconds. As the table begins to revolve, the work is clamped automatically by the cam *V* fixed to the center column as previously stated. During the stationary period, the feed cam feeds the cutters over the work thus performing the milling operations.

The following is the complete cycle for the machining of one pawl: The operator loads the fixture, after which it indexes to the first position; the cutter moves forward and completes the cut on the first finger and returns to rest. The table indexes the fixture to the second, third, and fourth positions completing all the cuts on the pawl as shown in Fig. 4. As the fixture approaches the unloading position, the clamp *A'* is released, and the lever *I'* comes in contact with the spring stop *J'*, forcing it backwards, withdrawing the locating pin *K'* shown in Figs. 3 and 4. Then a puff of air removes the part of any chips from the fixture, the empty fixture returning to the loading position.

■

Visible Speed Indicator—*Discussion*

J. Decker,
Mechanical Engineer, U. S. Rubber Company

W. Ochse describes how he obtained positive control over speed on a drill press by building a tachometer into that machine (*AM*— Vol. 75, page 387). In an article, "Geometric Progression in Machine Tool Speeds," written by me (Vol. 74, page 721), I mentioned that an effective speed control can be obtained, if every machine having a small speed ratio is equipped with a revolution counter or tachometer and with a table showing the r.p.m. and corresponding cutting speeds in relation to the rotating tool or work.

Temperature, pressure of steam, air and water, voltage, resistance, and current in every industrial sphere are controlled today with a high degree of efficiency. Apparently, it is not considered so essential to employ the same amount of ingenuity in controlling speeds and feeds on machine tools and general production machinery by similar means. The necessity for control on such machinery is just as imperative as in any other field, because machinery, not utilized to its fullest capacity, is a much greater neglect in a modern organization than a workman from whom the maximum of available energy is not obtained.

Since the machine is subject to close control, this control can and should be exercised to the fullest extent. The human element in its resulting effects is not reliable enough to be subjected to a standardized method in the same sense that a machine is.

Inasmuch as tangible results can with certainty be obtained from things in the realm of potentialities, why not benefit by them? As long as it is feasible to equip machines with means of control, it is only a matter of organization to make full use of these means for maximum equipment utilization.

The psychological effects are obvious. The worker's objection against "driving" could not be raised, as they are only doing what they are supposed to do. The whole combination of man and machine works with greater effect and without any injurious results to anyone. Another factor, not to be neglected, is the one that it will keep the supervisory force more on its toes and that the timestudy and estimating departments will have easier handling of matters relating to machine times and piece-rates.

For instance, there may be the case of a lathe hand running a lathe with 150 ft. per min. instead of 120 as given on his instruction card. He may do that to earn his premium under the pressure of an, in other respects, unsatisfactory timestudy. He will not complain because of the erroneous timestudy or analysis of the job, if he can make his money, as the higher speed will compensate for any other shortcoming. As long as he will get what is coming to him from a reasonable effort, the job is all right with him. If the foreman has no eye for speed, this condition may last indefinitely, everybody believing that everything was in order. Still the timestudy is wrong. Were the machine controlled things would look a little different. The man would not even try to run the lathe with a higher speed, but would complain, and this would result in an immediate investigation. A higher speed may have no bad results on the job, but the man does not know whether that speed will be economical or not.

Effective machine control will greatly contribute to the settlement of any disputes regarding satisfactory piece-rates and the efficiency of the workmen. It would also help to stimulate more interest in the question of standardization of machine tool speeds, because as a matter of course, many would be confused with the present conflicting state of having to deal with numerous different speed ratios. However, the main field for control would be the machines with an adjustable drive, be it motors, mechanical or hydraulic transmissions, or other means which allow a fine graduation of speed. This would also includes machines with any fine speed ratio.

Controlling Field Erection Costs

OPERATION NO.	DESCRIPTION	ALLOWED TIME
1	Level motor supports. Men required: 2 Machinists 1 Millwright 1 Rigger 1 Carpenter 1 Helper	45 Hr.
2	Erect gantry. Men required: 3 Helpers 3 Millwrights	132 Hr.
3	Lay lower bed plates and secure columns. Men required: 4 Machinists 2 Millwrights 2 Riggers 3 Helpers	176 Hr.
4	Position upper bed plates, level and secure, and install main drive shafts, etc. Men required: 2 Machinists 2 Millwrights 2 Riggers 4 Helpers	280 Hr.
5	Install 12 units, 4 folders and top rails and take down gantry. Men required: 10 Machinists 3 Millwrights 2 Riggers 2 Carpenters 1 Plumber 1 Painter 5 Helpers	1,439 Hr.
6	Final adjustment, complete all details, lubricate, run-in and tests. Men required: 3 Machinists 1 Rigger 1 Painter 1 Helper	128 Hr.
	Total time for complete installation:	2,200 Hr.

Fig. 1—This operation sequence covers the installation of twelve units and four folders

Naturally enough a large printing press cannot be shipped as a complete assembly, and field erection becomes a vital part of the whole manufacturing scheme. The scheduling of R. Hoe & Co., Inc., therefore, extends beyond the shipping platform into the customer's plant

▼

ERECTING COSTS on large machines in the field are usually more or less uncertain, depending largely on the judgment and honesty of the men involved. Even with the best of intentions on the part of the workers, costs may easily exceed a fair figure. After considerable study along this line, R. Hoe & Co., Inc., has inaugurated an erection schedule for its large presses that contains much that can be used in other kinds of work.

This schedule enables the company to predetermine erection costs much more accurately than before. It also guides and helps the head of the erecting crew, or leader, to plan his work more carefully and to avoid waste of time waiting for material or for one job to be out of the way before starting another. Further, the scheduling includes delivery of material to the erection crew, in the proper sequence and when required, and also sets the standard time for each operation and the complete installation.

Schedules are carefully prepared to show the proper sequence of the work, the number and kind of men for each stage of the job, and the time necessary for its completion. One such schedule is shown in Fig. 1, giving all the information needed by the leader of the crew. None of this planning, however, deprives the leader of his initiative, or tells him in detail how the work is to be done. Upon his skill, and that of the men under him, depends the proper care of the actual erection. The first schedule shown divides the erection into six operations and gives the number of men and hours required for each.

In the second schedule, Fig. 2, the operations, the men required, and time of each have been tabulated so that the leader can see at a glance just what is required each day. The first operation, for example, is to be done in a single day, the work being divided among two machinists, one millwright, one rigger, one carpenter and one helper, each working eight hours, except the rigger who works but five hours, a total of 45 hours.

The next operation calls for only millwrights and helpers, the number and hours of each being tabulated for each day. For the next operation, beginning on the seventh day, the erection foreman needs four machinists, two millwrights, two riggers, and two helpers, for two days, the daily totals of hours and men as well as the job total being shown at the right. This tabulation shows the leader just where he stands every day, not only as to total hours, but also as to specific operations and kind of labor to have ready on the job.

The cost of field erection is paid for by the customer when machinery is sold f.o.b. factory on a basis of time and material, or by separate contract, so that any economy affects the customer directly. Any reduction in the time required to install the equipment, which enables the customer to cut off heavy expenses by getting his plant in operation sooner, is an important factor in procuring orders.

While this exact scheduling only fits this special case, each job is planned as it comes up, and modifications are made in the standard procedure in accordance with the special conditions at the customer's plant. However, the standards, which have been set after much study, form the basis of all the planning and scheduling. This method gives much better control of erection than usually prevails. It has been found satisfactory in every instance where it has been employed.

Fig. 2—Man assignments are broken down daily

DATE	MACHINISTS		MILL-WRIGHTS		RIGGERS		CARPENTERS		PLUMBERS		PAINTERS		HELPERS		DAILY TOTAL		TOTAL	
	Men	Hr.	Men	Hr.	Men	Hr.	Men	Hr.	Men	Hr.	Men	Hr.	Men	Hr.	Men	Hr.	Men	Hr.
June 24	2	16	1	8	1	5	1	8					1	8	6	45	6	45
25			3	24									3	24	6	48		
26			3	24									3	24	6	48		
27			1	4											1	4		
28																		
29			1	8									3	24	4	32	17	132
30	4	32	2	16	2	16							3	24	11	88		
July 1	4	32	2	16	2	16							3	24	11	88		176
2	5	40	2	16	2	16							3	24	12	96		
3	5	40	1	8	1	8							3	24	10	80		
4																		
5																		
6	5	40	2	16	2	16							4	32	13	104	35	280
7	10	80	2	16	1	8	2	16					5	40	20	160		
8	10	80	3	24	2	16	2	16			1	7	5	40	23	183		
9	10	80	2	16	1	8	2	16			1	8	5	40	21	168		
10	10	80	3	24	2	16	1	8			1	8	5	40	22	176		
11	10	80	3	24	1	8	2	16	1	8	1	8	4	32	22	176		
12																		
13	12	96	2	16	2	16	2	16	1	8	1	8	4	32	24	192		
14	12	96	3	24	2	16	1	8	1	8	1	8	5	40	25	200		
15	10	8	2	16	2	16	2	16	1	8	1	8	5	40	23	184	180	1,439
16	3	24			1	8					1	8	1	8	6	48		
17	3	24			1	8							1	8	5	40		
18	3	24									1	8	1	8	5	40	16	128
19																		
		944		300		197		120		32		71		536		–		2,200

Cracks in Driving Axles

CRACKS in driving axles loom among the troubles of the locomotive repair shop man, and many methods are used to find them. For they are frequently so small as to be difficult of detection. One road heats the axles to a normalizing temperature when a locomotive is in for general repairs. And while it is cooling, they dip a whisk broom in water and brush it over the wheel seats and journals. They have found that a crack shows as a dark line while the water is being evaporated from the surface. It only shows for a second or two but is said to help greatly in detecting small cracks.

Some roads pull all wheels off the axles when shopped, and paint whiting so that oil will seep out of any crack and show where the defect is. This is said to be especially true if the whiting is left on while the axle or wheels are being returned. The vibration caused by tool action is said to hasten the seepage of oil out of minute cracks.

One general foreman informs me that they find more axle cracks about an inch inside the inner hub face than anywhere else. His practice is to pull all wheels off for two or three inches even where they would not otherwise be touched. He uses whiting to detect the cracks, which seem to start in the keyways. This road is beginning to experiment with keyways having a substantial radius in the corner and expects to reduce the breakage in this way.

Experiments have also been made with an electromagnet in at least one shop. As the cracks are nearly always circumferential, the magnet is rubbed langthwise of the axle a few times. The axle is then sprinkled with fine iron filings which form each side of a crack, one side acting as a north and the other as a south pole. This method is not, however, widely used.

Some roads too are abandoning the former practice of forging down and working over old axles for all sorts of smaller parts. The possibility of cracks and the cost of reworking make it cheaper to scrap the axles.

Optics in Metal-Working

The Bevel Protractor and the Optical Indexing Device

KEN G. NIBLACK
Bausch & Lomb Optical Company

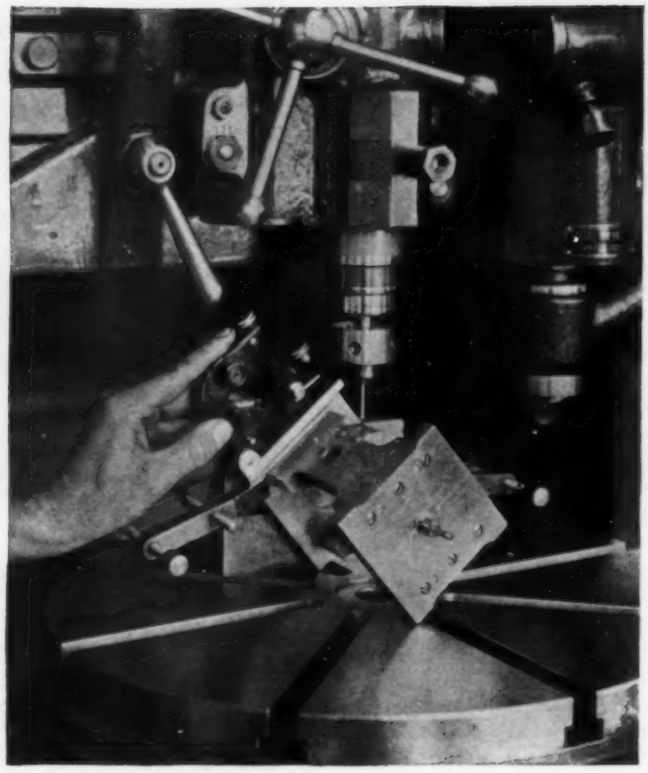
ANGLES have presented problems to men of all ages. Two hundred years ago the sextant, an optical instrument, was invented to measure the angle between the sun and the horizon and thereby give mariners their position in latitude. This was followed by the Wye level, the alidade, transit, tachymeter and theodolite used by surveyors, some of the latter making measurements from the horizontal as determined by a level built into the instrument. Many of the levels used in these engineering instruments are accurate to one or two seconds of arc. (One second of arc is the angle between two lines connecting the ends of a one-foot rule 43 miles away). Such a level makes a very precise measuring instrument and somewhat changes our early impressions gained while watching the neighborhood mason or carpenter use his crude level.

Using the horizontal as a starting position simplifies many machine-shop problems. Of course a correction is necessary if the machine or bench is not level. But after determining the correction, angles can be laid out from the horizontal easily and accurately. The little optical protractor described in the following paragraphs was designed for this work.

The optical protractor is built upon an adjustable base, and the center of the instrument revolves, carrying with it the level vial and the protractor scale that is seen through the eyepiece.

With these features, it is possible to correct the protractor for any inaccuracy from the true level in the bed of the machine, then to set the scale to the desired angle by looking into the eyepiece and revolving the protractor scale to the desired angle. The instrument is then placed on the work, and the work turned until the bubble in the level vial becomes central, a quick, simple and accurate method.

The optical protractor takes the place of the ordinary protractor, giving much more accurate results. It takes the place of the sine bar, and work can be done in shorter time and without as great a possibility of error. It will do everything a 6-in. sine bar will do with equal accuracy and in a much shorter time. It will permit many set-up operations and checks of which the sine bar is incapable.



The usefulness of the protractor is extended by using an angle plate

Nearly two years have passed since the introduction of this instrument, and uses have been coming to our attention which we feel should be passed on.

A handy accessory device for setting up jigs and fixtures was recently noticed in our plant. The operator of the jig boring machine had constructed a simple angle-plate arrangement which he used in conjunction with his optical bevel protractor to set up a job for drilling or boring. This man claims that it formerly required about six hours to set up an angular job when using the sine bar and buttons, but with this simple arrangement it takes only half an hour. He says that the time is also shorter than that required to set up a dividing head, which was his only alternate way of doing an accurate job.

A plate such as this man used can be made by any machinist from a cast-iron angle by following the sketch shown in Fig. 2. The only accuracy required is in the slotting and positioning of the pin, as shown on the diagram. Accuracy should be held very close at these two points.

The pin can be a quarter of an inch in diameter, and special bushings can be made for holding work with larger center holes than would fit on this. The $\frac{3}{4}$-in. slide is adjustable for holding work of different heights and is held in position by a thumb screw. By inverting the slide, if constructed as shown, twice as many positions are available for the pin.

The work, if it is a jig or fixture, can be set up so that the pin is through the center hole in the work, and one clamp can be placed on one side to hold the work in the approximate position. The optical bevel protractor after being adjusted to zero with the bed of the machine is set to the desired angular relationship and placed upon the work. The work is then tapped into the desired

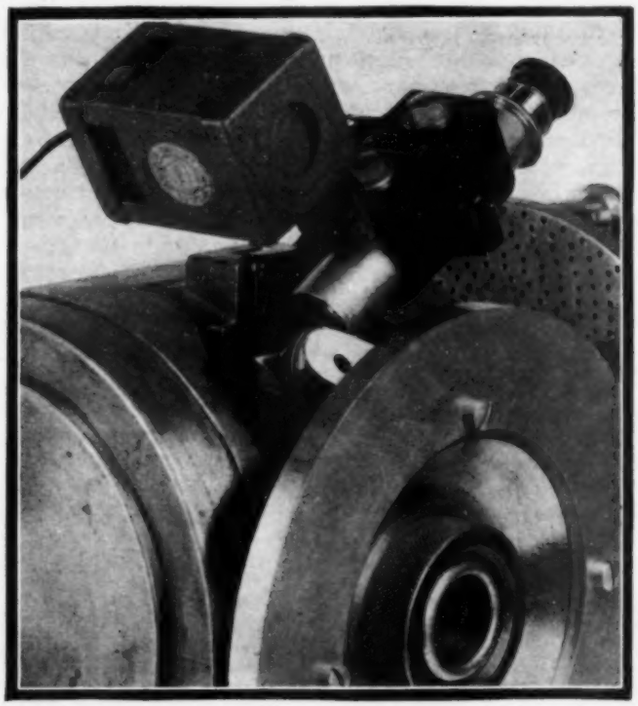
angular position which will be indicated when the bubble in the vial becomes central. The work is then clamped firmly on the opposite side of the center pin and can be positioned for boring with the assurance that the angle will be correct.

This is an easy and accurate method of setting up work on a jig borer, and it is of equal value on milling, drilling, grinding, planing and shaping machines.

The optical protractor is also used on the bench for layout or inspection of jig and fixture parts. The toolmaker clamps his work in a vertical position on an angle plate, which is set on a surface plate, and uses his protractor the same as he would a sine bar. No special experience is necessary.

The instrument is so simple that only elementary instructions are necessary. When inspecting a piece of work the protractor scale is set at zero. The instrument is placed on the bed of the machine or surface plate and adjusted until the bubble in the level vial comes central. Then it is placed on the work and the center section is revolved until the bubble comes central again, when the angular relationship can be read directly through the eyepiece. The level is a valuable convenience factor, for it permits the measurement of angles from the corrected horizontal of the base of the machine.

Of course, the protractor is accurately made, the dial itself being graduated to $\frac{1}{6}$ deg. and every degree line being designated by a number. The graduations are observed through an eyepiece which so magnifies the spaces between the graduations that a vernier can be read with ease to one minute of arc. Mechanically it is designed in a convenient form for most work. A fine adjustment screw serves to position the protractor scale accurately after it has been approximately positioned by means of the slip handle shown below the level vial. A clamping arrangement holds the instrument at the desired setting while it is being used.



The graduated back of the graduated steel disk is observed through the microscope. The proper line and the regular indexing must check

The Optical Indexing Device

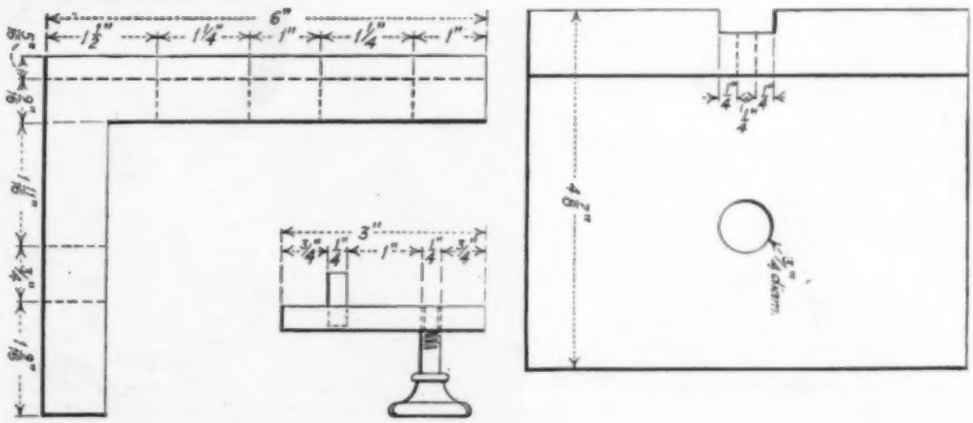
Some of us like to be shown. We want to see that a job is being done properly and not depend upon the heralded accuracy of a device. Continued use eventually reduces the accuracy of any mechanical device and it becomes necessary either to rebuild or junk the machine. But, if we watch, with the assistance of optical equipment, we can see that good work is being done.

Any dividing head will do precise work with an optical indexing device. Worn milling machines will space work accurately if a master scale traveling with the work is observed through a stationary microscope tube with a cross line in the eyepiece. Many uses are found for the microscope in observing the accuracy of machines or the work in process, but the indexing device is of particular interest. It consists of a graduated steel disk, attached directly to the dividing head, an illuminating attachment and a microscope. The work is attached to the graduated disk and rotates with it.

In use, the operator indexes the work in the usual manner, then observes the graduation engraved on the steel disk by looking through the microscope. If the line in the microscope does not coincide with the line on the disk, the operator makes the necessary correction before starting to make his cut.

The steel disk has three graduated circles of 720, 91 and 800 divisions which cover the majority of jobs.

The optical indexing device eliminates many errors, thus effecting a saving in time and material. It has been used for accurate positioning of work for milling, drilling, boring and grinding; for machining many types of work, including gears, cams, index plates, etc. This equipment is available for either Brown & Sharpe or Cincinnati dividing heads.



Parts to be drilled or machined at an angle may be set up by means of the angle plate and protractor

Psychology and Salesmanship in Applying Time Study

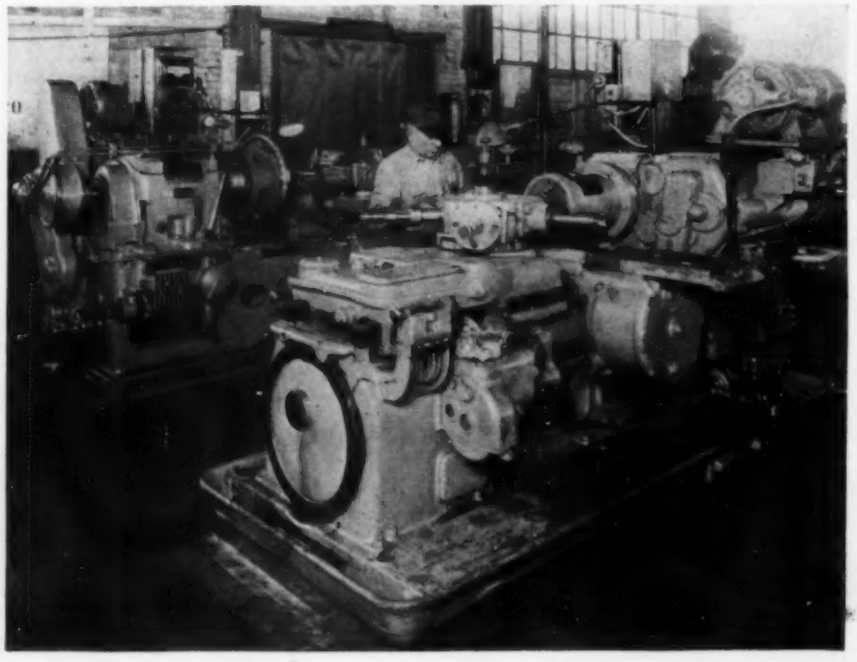
It is a self-evident fact that psychology and salesmanship, whether called by these or any other names, are aids to anyone. Who has greater need of them than the time-study man, who often has to convince both management and men that he is doing each a favor?

R. W. GRAY
Time Study Supervisor
Westinghouse Electric and Manufacturing Company

SHOP executives and production men are in general agreed that workmen, when left to their own initiative seldom produce their capacity. But it has been proved time and time again that the workman's interest in production can be stimulated by a wage incentive system. Having applied a wage incentive plan, it is important that a favorable mental attitude be maintained by the workmen. To develop such a favorable mental attitude, it must be proved by the time-study man that the studies taken are accurate and just—and this involves salesmanship and psychology. The reasoning used for one type of workman may be entirely different from that used for another type. A comparison of the elapsed and allowed time may be sufficient for one type of workman; an explanation of the time studies taken may be necessary for another type; and for a third type a detail analysis may be necessary. The workman must realize and believe that a reward is being offered. Once a favorable mental attitude has been obtained, very little arbitration or compromising is necessary if fairness both to the company and to the workman is the principle upon which the time-study methods have been constructed.

Time-study methods employed in a department not operating with a wage incentive are at times opposed by the foreman or head of the department more than by the workmen. The reason for this opposition may be that the foreman considers everything possible has been improved upon. If, after the time-study man has carefully made an analysis of a job and detailed time studies show that twenty-four men could perform the work that at present requires forty men, it usually results in a pill that cannot be swallowed. A statement of this nature places the departmental head on the defensive, and he is naturally interested in justifying the number of workmen employed. Discussing the elimination of each unnecessary movement or each unnecessary operation with the departmental head at the time the study is made usually results in a reasonable understanding. When methods of procedure are being changed, it may be advisable to arrange a demonstration to show a definite comparison between the old and the new method. Delay in installing a wage-payment plan can be reduced to a minimum only when the departmental head thoroughly understands each conclusion derived from time study.

Methods, procedure, and the sequence of operations must be determined on a total cost basis. Determination of the speed of a machine or the feed of a tool should be made only after consideration has been given to the ultimate results. The machine may run two thousand



One of the problems of time study centers around the question of how many machines one man can profitably operate

revolutions per minute for a short period of time and then require costly repairs. The machine repair cost that could be attributed to excess speed may more than offset any saving realized on manufacturing the part. Excess feed on a tool may effect a two-dollar saving in manufacture but destroy a tool valued at three dollars, resulting in a loss of one dollar.

The justification of a time-study analysis of operations dependent upon the knowledge and exactness of the operator is at times questioned. "What will happen if the operator disregards quality for quantity?" is a question that often arises when consideration is given to the application of a wage payment where highly skilled workmen are employed, or to operations of hand arc welding where the quality of the weld is largely dependent upon the workman. The reasoning used in this question is that if a workman is given sufficient time he will produce a part nearly perfect. Sufficient time should be allowed to perform an operation comparable to the various degrees of accuracy required. The accuracy required, in most cases, is dependent upon the application of the part. Any additional time worked toward further improving the part is wasted.

When hand arc welding operations became extensively used for the construction of fabricated parts, the justification of applied time-study methods to these operations was questioned. Time values and cost estimates determined from these data were necessarily analyzed when several serious failures of welded parts were reported. It was necessary to arrange a demonstration to show that time study was not at fault.

Two hand arc welding operators were selected to work on two identical oil-tight tanks. One operator was guaranteed seventy cents per hour for each hour worked. The second operator worked on a tank for which an equitable time value had been established. Provided the elapsed time was equal to or less than the established time this operator was to be paid at the rate of seventy-two cents per hour for the established time. If he failed to meet the established time he was to be paid $0.65 per hour for his elapsed time. If the weld should prove to be defective all time required for repairing was to have been considered as elapsed time against the original established time. The result of this experiment showed that the second operator not only increased his hourly earned rate to ninety cents per hour, but produced an oil-tight tank in sixty-five per cent of the time required by the first operator. The production per operator increased, and in no case did the quality of the weld suffer. Hand arc welding operations performed by many of the leading industries are at present worked on a wage incentive basis.

Incentives for Inspectors

The inspection of detail operations on machined parts was, at one time, performed exclusively on the hourly rate basis. This, supposedly, did not create an incentive for one of the inspectors to slight his work, but it did, in many cases, permit an inspection cost of three cents on a part that could be sold for only two cents. A time-study analysis of the operations of this nature will disclose many startling facts. It may be found that a diameter is being gaged when that diameter is unimportant; the length of another part may be gaged when a following operation, during assembly, requires that the part be trimmed to length, or detail inspection operation may be performed on only a percentage of a total quantity. When a detailed inspection is required it becomes necessary to inspect every part manufactured, but the tendency is for hourly paid inspectors to over-inspect parts during low activity and to slight inspection operations during high activity.

A time-study analysis of detail inspection operations in one department proved conclusively that this work could be performed for one-half the previous labor cost. The wage-payment plan installed, provided that the detail inspectors work under the supervision of the departmental head, but under the observation of a member of the inspection and test department who is responsible for inspection of all parts shipped. Parts re-inspected by the detail inspectors, because of their neglect to correctly inspect the part the first time, are not paid for. Specific inspection operations dependent upon the application of the part appear on the sequence of operations for the manufacture of each part, and time is allowed according to the inspection operation required and the size and nature of the part. If the operation calls for "Gage the diameter of the hole with plain plug gage" or "Inspect threads on thread comparator," it has been definitely determined that this is the only detail inspection necessary and time is allowed for its performance. Fewer defective parts escape detection under this method than under the guaranteed hourly rate plant.

How Many Machines Per Man?

With the development of automatic and semi-automatic equipment, it is becoming more and more common for one operator to operate more than one machine. Hand-operated machines and heat-treating furnaces are being so located that one operator can operate more than one hand machine—when machine cuts of long duration are performed—or attend to a battery of more than one heat-treating furnace. The layout of equipment very often is arranged in accordance with the operations and procedure predetermined by the time-study man. Time studies taken of operators working more than one machine may be lacking in detail if the time-study man does not recognize the difference between the work performed by the machine or equipment and that performed by the operator.

When one operator is assigned to the operation of more than one machine the ultimate point requiring a definite decision is "What is the correct number of machines that one operator should operate?" The number of machines assigned is in some cases arbitrarily determined. At other times the number is determined from some one operator who can operate a given number of machines. The correct method of determination should be based upon the work performed by the operator for the manufacture of a part and the quantity of that part to be made. (Quantity is necessarily considered so that no excessive number of machines are idle during a machine setup.)

Determination of the number of any type of machine that should be operated by one operator before time studies of the work performed by the operator have been made, is placing the cart before the horse. Operation of automatic screw machines may be based upon the assignment of two or more machines per operator, but sufficient equipment should be available to permit the operator to operate an unlimited number of machines. No specific number should be assigned if it is desired that a wage incentive be offered to the operator.

Assume that four No. 2 single-spindle automatic screw

machines have been assigned to each operator. Time studies made of the manufacture of various parts will prove that for some parts the operator works only two-thirds of his time while for others he will be unable to maintain the operation of four machines. In the first case the operator is being paid for waiting time or machine operation time, and in the latter he is either penalized or allowed an extra allowance. Arbitrary quantities must be established to prevent excessive machine set-up delays, and the earnings of the operators are limited by the speed of the machines.

The solution of any time-study problem cannot be based upon theory alone. Neither can one be solved by a collection of data and a definite knowledge of the work. Sound reasoning, good judgment, accurate data, theory, and knowledge must be combined for accuracy.

■

NEW BOOKS . . . . . .

ECONOMICS FOR ENGINEERS—*By Edison L. Bowers, assistant professor of Economics, and R. Henry Rowntree, instructor in Economics, The Ohio State University. 490 pages, 9x5¾ inches. Bound in cloth boards. Indexed. Published by McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y. Price $4.00.*

As engineers take their places in this complex economic and political world, the necessity for broad training becomes more and more apparent. Realizing this the authors have prepared this exceedingly thorough book "to present a factual basis for a practical understanding of the economic life of which every engineer is inescapably a part." Though the work appears as a textbook for engineers, it will be found to serve equally well as a book of reference for any business man in any business library.

Starting with a clear statement of "the economic approach," the authors lead the way through underlying theory to most realistic and concise presentations of marketing, finance, management, and the host of economic concerns. The whole is topped off by a chapter on the relative efficiency of the economic machine. If the reviewer has a criticism to make, it is that the most interesting and practical material seems too many times to be set in the smallest type.

DYNAMISCHE UNTERSUCHUNG DES FRASVORGANGES (A Dynamic Investigation of the Milling Process)—*By F. Eisele. Berichte uber betriebswissenschaftliche Arbeiten, Vol. 7. Berlin, 1931. VDI Verlag, publishers. 14 pages, with 125 illustrations and one table. Cloth covers. Price 11 Reichmarks.*

Considerable discussion was engendered at the A.S.M.E. annual meeting over the paper on "Elements of Milling." Here is a study made in Germany which overcomes part of the objections to the American paper. Where the American study was made with a single-tooth cutter and a pendulum dynamometer, this study has been made with commercial cutters, straight-tooth and spiral, under commercial cutting conditions. This particular study was made in an effort to discover the character of the vibrations which cause cutter chatter and the kind, magnitude, and time sequence of the fluctuations in cutting pressure which cause them. It was first necessary to create new experimental equipment. With this equipment, the general laws for the three cutting pressure components and their fluctuations, and the vibrations in the machine resulting from them, were investigated. Tests were carried out with wide milling cutters on different materials and at various table feeds, cutting speeds, and cutting depth. Cutting pressure diagrams obtained in these tests showed unduly large and disturbing cutting pressure fluctuations, which are discussed. Entirely new in this connection are the curves derived for the vertical component, which differ fundamentally from those of the feed and axial components. Beyond this, the tests yielded valuable data for the theory of metal-cutting generally as well as for practical use by designers and production engineers, especially for use in heavy milling. Rules for combating and preventing vibration can be derived from the cutting-pressure diagrams and should be of fundamental importance, particularly in the design and construction of light-metal and tungsten-carbide milling machines.

WAGES AND THE ROAD AHEAD—*By James D. Mooney. 149 pages, 5x6½ in. Cloth board covers. Published by Longmans, Green & Company, 55 Fifth Avenue, New York. Price $2.00.*

The depression is with us, for how long no one knows. What caused it and how we are to get out of it comprise the thesis of this book. Its theme, all through, is the justification for wage cuts and the unavoidable necessity for every one to get down to good old fashioned hard work. The labor unions, particularly the building trade unions, come in for severe criticism. So also do tariffs.

The author believes in the soundness of American "wealth for everyone," believes we will arrive at it through the same hard work that has got us this far along. He offers no panaceas, no palliatives or sedatives, and condemns those already advanced, for one reason or another. If he contributes no brand new and vital thought, he does remind us forcibly that two and two can only make four, and no way we juggle the figures will make them add up to anything else.

BIBLIOGRAPHY OF MANAGEMENT LITERATURE—*(Including an author index). 142 pages, 7¾x10½ in. Paper covers. Published by the A.S.M.E Price $2.*

BIBLIOGRAPHY ON EFFECT OF TEMPERATURE ON THE PROPERTIES OF METALS, *and a SUPPLEMENT—Each 27 pages, 7¾x10½ in. A.S.M.E. research publications, published by the American Society of Mechanical Engineers, 29 West 39th St., New York, N. Y. Price $0.75 each or both for $1.35.*

Important management articles of the past quarter century are listed in the first of these bibliographies, some 2,500 additional articles being added to the 2,000 published up to four years ago and listed in the first edition. This reflects the tremendous growth of the literature of management. The second bibliography here listed was published in 1928, the supplement being the articles on the subject since that time. These are important adjuncts to the library of the man interested in either of these two subjects—and who isn't?

Ideas from PRACTICAL MEN

A Self-Balancing Chuck

JAMES L. INGALLS

When two holes are to be bored side by side in the same piece in the turret lathe, both the work and the holding fixture must be out of balance when the work is set for boring either of the holes. This will set up vibrations proportionate to the center distance of the holes, the weight of the work and its holding fixture, and the number of revolutions per minute.

We had a quantity of pieces, such as the one shown in heavy dotted lines in the illustration, to bore and ream. To counterbalance the work and the holding fixture automatically, we designed the chuck illustrated. In the swinging work holder *A*, which is firmly attached to the pivot pin *B*, the work is located by means of three locating screws and one clamp screw, and is held down by two swing clamps, one of which is shown in section at *C*. When the work holder brings the work in position for boring the hole *D*, it is locked by the index pin *E* and the clamp screw *H*. To set the work for boring the hole *J*, the work holder is unlocked and swung to the left, the index pin is placed in the hole *K* and the screw *H* is tightened.

When the work is in position for boring either of the holes, both it and the work holder are out of balance. By a simple device an opposed weight is added, so that a good working balance is secured. The weight and its operating device are mounted on the inner side of the chuck cover, and are shown in the view at the left. The gear segment is attached to the inner end of the pivot pin *B* and swings in unison with the work holder. A pinion segment, pivoted at the center of the chuck and meshing with the gear segment, terminates in an arm carrying a counterweight that is diametrically opposed to the off-center weights of the work holder and the work.

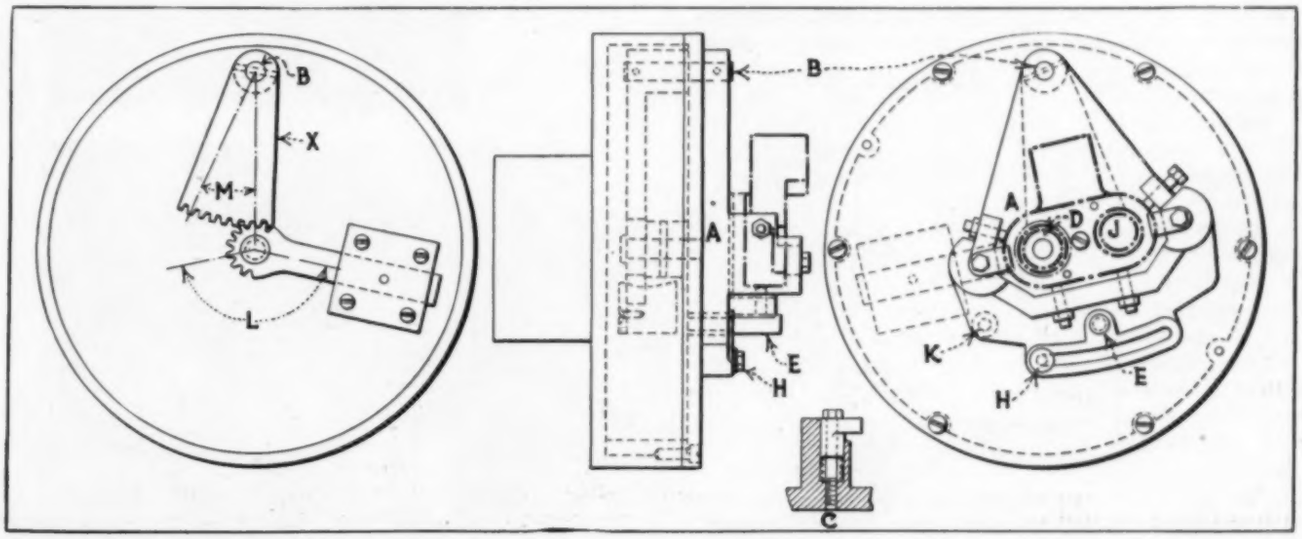
In the view at the left, the counterweight is in the position for balancing the off-center weight when the hole *D* is being bored. When the work and the holder are shifted into position for boring the hole *J*, the counterweight will swing to the side opposite to that in which it is shown, maintaining the balance. In its two extreme positions, the weighted arm must lie in the same planes as those of lines drawn through the centers of the holes to be bored, when the work is in each position, its travel being represented by the arc *L*. The angle *M* is found by drawing lines through the center of the pivot pin and the centers of the holes to be bored. The ratio of the angles *L* and *M* is equal to the ratio of the gearing.

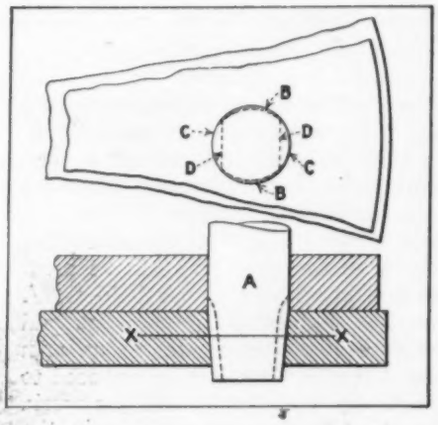
For work varying in the center distance of the holes to be bored, interchangeable cover plates can be put on the chuck, each one having a work holder to suit and a counterbalancing device correctly proportioned.

Correct Shape of Index Pins and Notches—*Discussion*

HARRY SHAW
Consulting Engineer
Heywood, Lancashire, England

In an article under the title given above (*AM*—Vol. 75, page 180), R. H. Kasper mentions that no index pin will locate properly when worn. A taper index-pin, as at *A*, may be badly worn on the locating faces *B* and yet will not enter farther into the index hole, owing





to unworn surfaces *C* making contact. Sometimes the good fit of the index pin in one direction leads one to believe that the pin is not worn, with consequent trouble from unknown faulty indexing. This fault can be cured by making flats D on both sides of the pin, so that the absence of metal at those points will allow the pin to enter farther into the hole as it wears. By this means, the correctness of indexing can be maintained for a much longer period than usual.

When draftsmen have complained of faulty indexing in their drafting machines, I have often taken out the indexing pins and ground flats on their opposite sides. To the surprise of the draftsmen, the machines functioned satisfactorily after the flatted pins had been put in place.

Temperature Control of Quenching Baths—*Discussion*

R. H. URE
London, England

The quenching of steel in hot water, as suggested by Warren F. Manthei (*AM*—Vol. 75, page 464), certainly possesses the advantage of leaving hardened parts in a clean condition for electro deposition. The suggestion, that hardening in the manner, even with adequately controlled water baths, can replace oil hardening, is dangerous. Between oil and water as quenching media are great, yet subtle, differences, among which are specific heat, latent heat, thermal conductivity, and viscosity.

It is possible, that with relatively small parts of even section with a carbon content not greater than 0.7 per cent, the temperature of a water quenching bath might be so adjusted as to produce similar results as the ordinary oil bath. But for larger parts and the more complex alloy steels, water as a quenching medium is practically out of the question. It is well known that many steels can be hardened fairly satisfactorily in water, providing manipulative skill is exercised in the actual operation of hardening.

It is noted, that in the original article, the fire hazard of oil bath is mentioned. We cannot however agree that this exists; the flash points of commercial quenching oils are so high, that they are less likely to ignite than the common materials of construction.

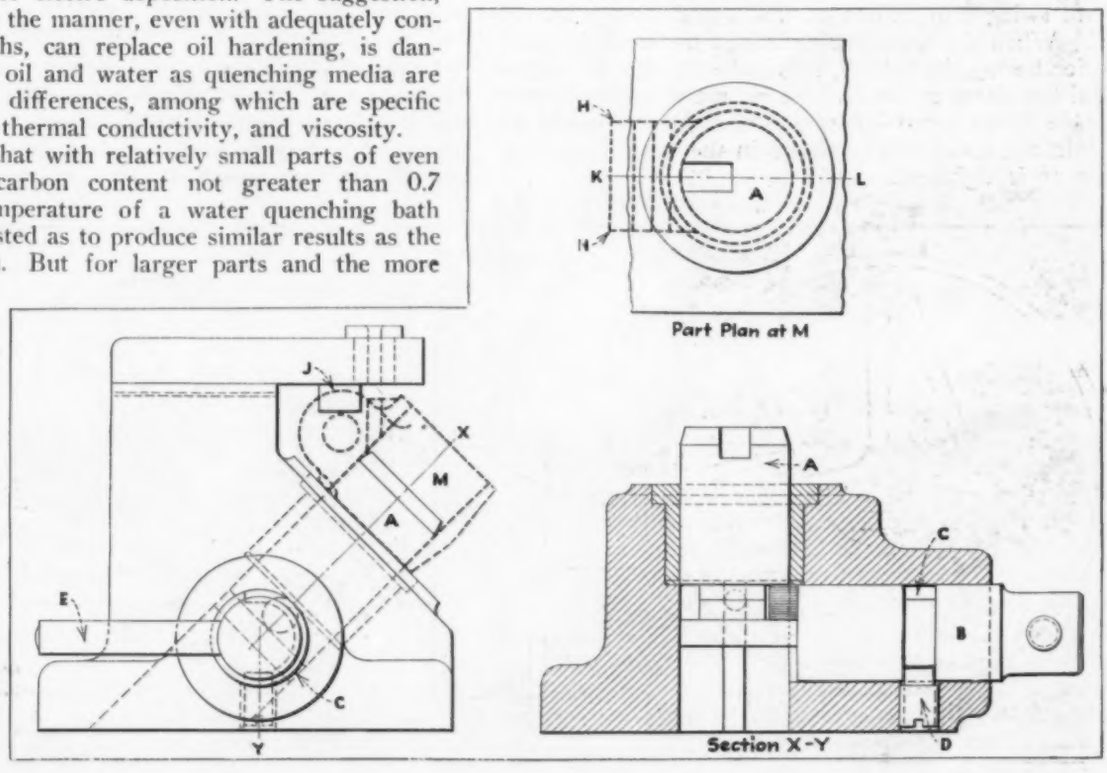
In conclusion, I should like to remark that the plating of hardened steel parts is a delicate operation and one which cannot be adopted without considerable investigation. The process of electro deposition is likely to be injurious to hardened steel, because of a process involving the occlusion of hydrogen. For this reason, the springs employed on shot guns are browned or blued and not plated. Much of the difficulty may be eliminated by careful control of the current density, but it would seem that cadmium is by no means an ideal medium, since its economy depends upon reducing the operation time.

A Quick-Acting Drill Jig

W. L. WATERHOUSE
Smethwick, England

The jig shown in the illustration was designed for drilling $\frac{1}{8}$-in. oil holes in bearing collars, one of which is indicated by heavy dotted lines in position in the jig.

The time-saving feature of this otherwise simple jig is the means adopted for placing the work on and removing it from the locating plug *A*. A groove is cut in the lower end of the locating plug into which fits the eccentric pin on the shaft *B*. The travel of the plug is controlled in both directions by the circular groove *C*, which is milled to permit 180-deg. movement of the eccentric pin, the screw *D* acting as a stop in both directions. In operation, the lever *E* is pulled toward the operator, rotating the shaft *B* and drawing the locating plug into the body of the jig by the action of the eccentric pin. The work is then placed in position and the lever is pushed away from the operator, thus pushing out



the locating pin from the body of the jig and into the work.

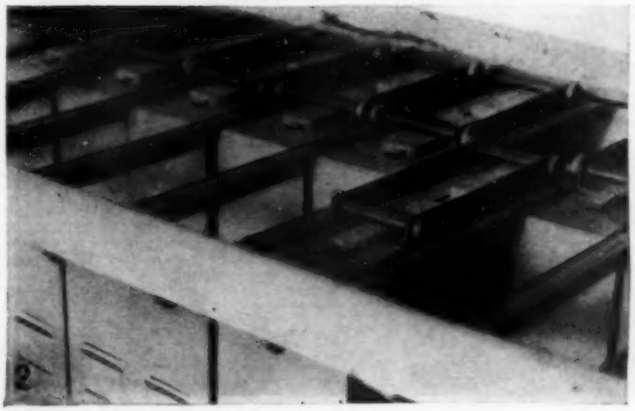
After a collar has been drilled, the withdrawal of the locating plug permits it to drop from the jig, which is then ready for loading again. Faces *H* in the collars, which have been milled in a previous operation, fit between locating pieces *J* and insure the correct location of the oil hole in relation to the center line *K-L*. With a fixed locating plug, it would be necessary to allow considerable clearance between it and the bushing plate to place and remove the work, because of the angularity.

Containers for the Toolcrib

CHARLES HOMEWOOD

A neat and compact method of storing small tools in the toolcrib is shown in Fig. 1. The tools are hung on panels that are framed in the centers of 6-in. boards, so that they can be hung on both sides of the panels, the frames preventing interference with them as the panels are slid in and out. Instead of swinging upon hinges, the panels are suspended from carriages in which ball bearings are used for wheels, the outer races forming the treads.

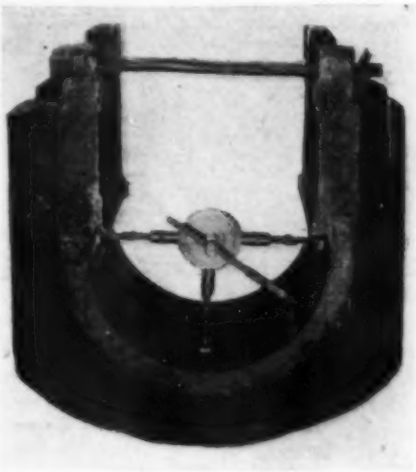
The tracks upon which the carriages run, as shown in Fig. 2, are 1½-in. T-irons and are attached at the ends to 3-in. angle irons. The rear angle iron is fastened to the wall, while the front one is held at the ends by rods fitted with turnbuckles. As the full weight of each panel is sustained by its own carriage, little effort is required to pull it out or push it in. When a panel is pulled out, the tools on both sides are in plain sight.



A Crown Brass Gage

FRANK C. HUDSON

Gages for measuring the crown brass fits in driving boxes exist in a variety of forms. The Norfolk & Western uses the gage illustrated and finds it satisfactory. The gage is centered by the three adjustable locating arms and the measuring arm contacts with the surface as it is swung around the center. A spring actuated contact point shows any variation by means of the indicator and scales on the flattened portion.



A few thousandths below size are enough to give a loose fit while an equal amount the other way may give a fit tight enough to be detrimental. Gages of this kind save a lot of time in fitting crown brasses.

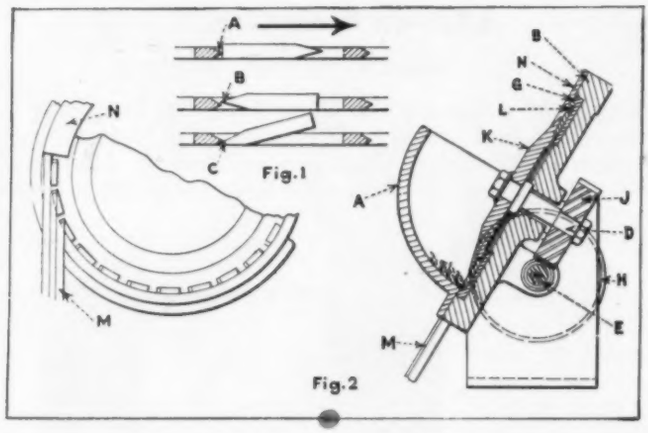
A Self-Ejecting Hopper

JAMES R. CORNELIUS
Machine Designer, Coventry, England

The engineer has often some rather ticklish problems to unravel, and as a rule, he finds pleasure in solving them. On one occasion my problem was to find a method of automatically feeding pointed pins, such as the ones shown in Fig. 1, from the work chute of a grinding machine to an assembling machine. The pins were to be assembled, point foremost, in wooden stock and this necessitated their being fed through a chute, point in advance, ready to be pushed into the stock without further selection. After one or two futile attempts, some of which utilized fairly delicate machinery, we arrived at the apparatus illustrated.

With this device, it was necessary only to let the pins fall from the chute of the grinding machine into the container *A*, Fig. 2, after being assured that all the water has drained away from them and that they are fairly dry. The container half covers the front face of the casting *B* that houses the hardened steel ring *C* and forms a mounting for the spindle *D* and the worm *E*. The worm is driven by a belt on the pulley *H*, and drives the worm-wheel *J* and the plate *K*. On this plate is located the driving ring *L* which fits flush against the hardened ring *C*. In the periphery of the driving ring are cut notches, or pockets, that are slightly longer than the pins to be fed. The leading face of each projection from the pockets is indicated at *A*, Fig. 1, the sharp edge being nearer to the ring *C* than to the ring *L* when mounted in the hopper.

The thickness of the ring *L* is two-thirds the diameter of the pins, thus permitting the pins to lie with the upper parts of their bodies above the ring *L* when they are flat



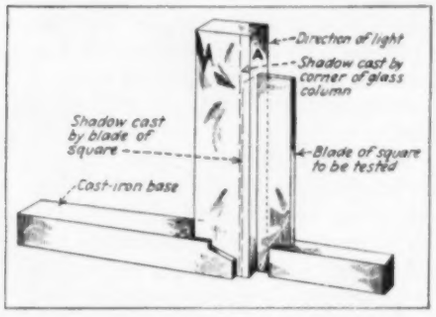
in the pockets and against the ring *C*. It will be seen that when the ring *L* is rotated in the direction indicated by the arrow at the top of Fig. 1, the pins will be positively carried forward, but if caught in the pocket as at *B* or *C*, the tendency of the sharp edge at the end of the pocket will be either to lift or depress their points, causing them to lose their equilibrium and to fall out of the ring. When the pins lie in the pockets correctly, they are carried around with the ring *L* to the discharge chute *M*. A slight groove in the ring *C* permits the top pressure plate *N* to press the pins into the groove and thus out of the hopper and along the chute into the assembly station.

Making and Testing a Flat Square
Discussion

C. G. WILLIAMS

Referring to the comments by Wm. Butzlaff on the testing of squares in an article under the title given above (*AM*—Vol. 75, page 250), the sketch illustrates a much easier method.

A rectangular column of glass, about 1x3 in., and longer than the blade of the largest square to be tested, is held vertically in a cast iron base, mounted on a surface plate. The side *A* is ground accurately straight and is held at 90 deg. to the surface of the surface plate. The side *A* and its two adjacent sides are polished, their edges are true lines, and the corners are sharp.


Direction of light
A
Shadow cast by corner of glass column
Shadow cast by blade of square
Blade of square to be tested
Cast-iron base

If light is allowed to strike the glass at an angle to one corner, it will be found that the shadow of that corner will be cast as a straight line against the opposite side. If the blade of a square is brought against the side *A*, it will be found the blade will also cast a shadow on the side of the glass column. If the blade is accurately true, the shadow will be a true line and will be parallel with the line formed by the corner of the glass column. If the blade is not true, the line will not be a true line, but will be curved or wavy. Again, if the blade is accurately 90 deg. to the stock of the square, the line cast on the side of the glass column can be made coincident with the shadow cast on the side by the corner. On the other hand, if the blade of the square is not true with its stock, its shadow will form an acute angle with the corner of the glass column.

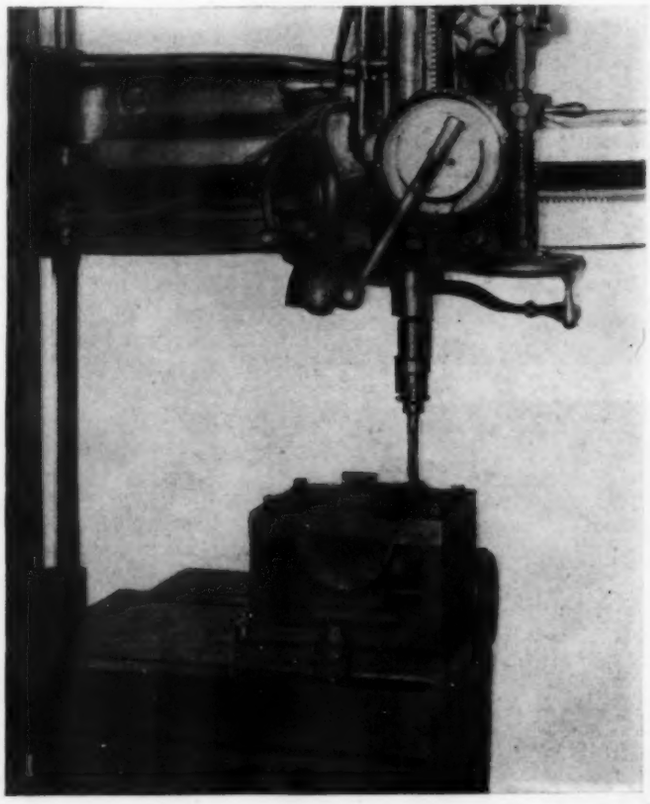
This method is an offshoot of the method of testing the bore of a rifle by a shadow cast by a bar on the surface of the bore.

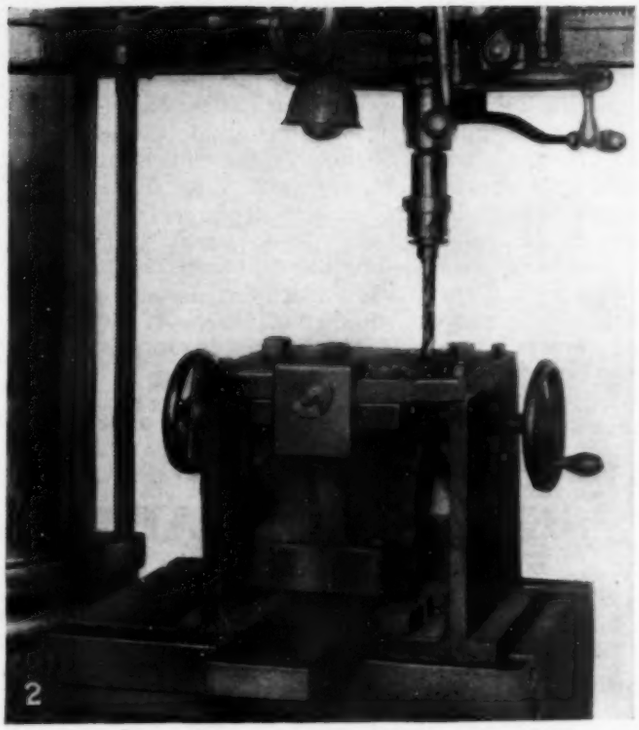
Two Drilling Fixtures

Double faced bushing plates are used by R. Hoe & Company on a number of standardized jigs, as in Fig. 1, where the holes for four bolts are being drilled in the bearing support, this tongue being used to locate the cap on the bushing plate while the plate at the end determines the endwise position. The bearing cap is held up against the plate by the screw operated wedge beneath, the wedge sliding in planed guides. The upper side of the bushing plate is planed with a tongue to fit the bearing support when turned over and used on another jig. This method insures alignment of the four bolt holes.

Another form of wedge holding fixture is seen in Fig. 2. Here the wedges act on the under side of the bearing flange, position being secured both by the pin shown and by the clamp in the front. Another feature is the extension on the base to make it easier to handle the work in and out of the fixture. The piece, which is fairly heavy, is lifted to this extension and then slid into place, this process being reversed after the holes are drilled.

These fixtures enable easy set-up of irregular parts,





or those machined on one side only, which are difficult to level up and hold. They are also adaptable for various parts by changing the bushing plates only, which are inexpensive.

Jig for Drilling Crossholes

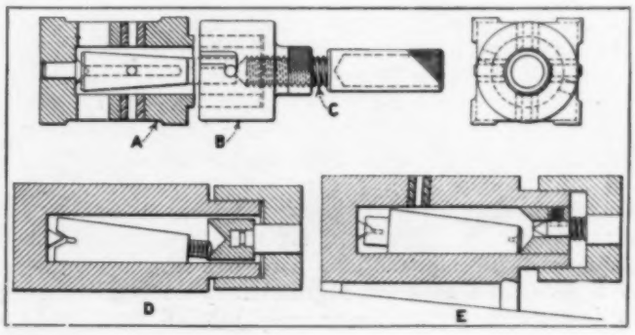
WM. C. BETZ
Master Mechanic, The Fafnir Bearing Company

Where one or more crossholes are to be drilled in tapered work, or in turned work of odd shape, either square with the axis or at an angle to it, and where the indexing must be accurate, a jig similar to the one illustrated will be found useful.

The headpiece *A* may be square, or it may have any number of sides, according to the number of crossholes to be drilled. Both it and the tailpiece *B* carry centers that may be either pointed or cupped, according to the work to be supported. The tailpiece is bored to fit the round part of the headpiece and is secured to it by a bayonet lock.

In operation, the work is inserted in the headpiece against the center and the tailpiece is slipped in place and secured by the bayonet lock. Tightening the screw *C* engages the center in the work and holds it in place. The large holes near the left-hand end of the headpiece are for the removal of chips and to see that the work is properly in place.

If the crossholes are to be drilled at an angle to the axis of the work, as at *E*, the legs of the jig are made to correspond to the angle. Where the center in the tailpiece will not readily engage the countersink in the small end of the work, either a plain cupped center, as at *D*, or one backed by a spring, as at *E*, can be employed.

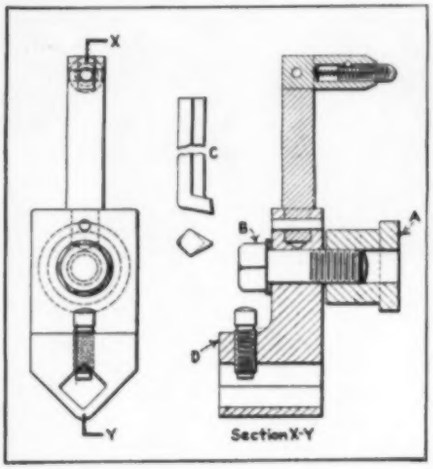


Toolholder for Slotting in the Shaper

CARL E. SCHINMAN
Mechanical Products Manufacturing Company

The toolholder illustrated is designed for holding tools for slotting dies and other work having irregularly-shaped openings. It is especially useful in small shops having no slotter or slotting attachment.

In use, the regular toolpost of the shaper is removed and the round nut *A* is put in place from the back of the clapper. The toolholder is then held in place by the capscrew *B*. Any desired form of slotting tool can be held in the square hole by a setscrew. The spring-plunger mechanism at the top of the holder bears against the face of the down-side, above the clapper box, and keeps the point of the tool against the work.



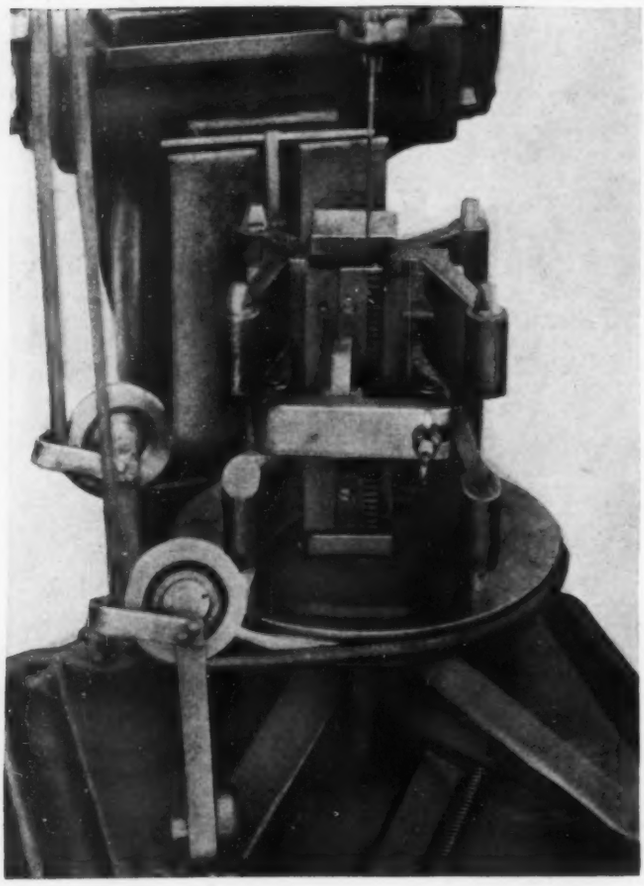
A typical tool for use in this type of holder is shown at *C*. Tools can be made from either round or square stock. It will be seen that the toolholder can be swiveled either to the right or the left, and that the location of the square hole permits the use of the tool close to the jaw of the shaper vise. It will also be noted that the face *D* can be brought close to the work, thus permitting the use of short tools—an important feature when slender tools are used.

Drilling Deep Holes

A. E. GRANVILLE

It is common practice in drilling deep holes to rotate the work as well as the drill. Rifle barrels have been drilled in this way for years. However, the method used for drilling holes lengthwise in soft-steel "combs" is rather unusual, since the holes are drilled from both ends. The holes are 8 in. deep and $\frac{1}{8}$ in. in diameter.

As shown in the illustration, the jig for holding the work is mounted on a revolving table driven from the machine spindle, the belt being guided by small mule



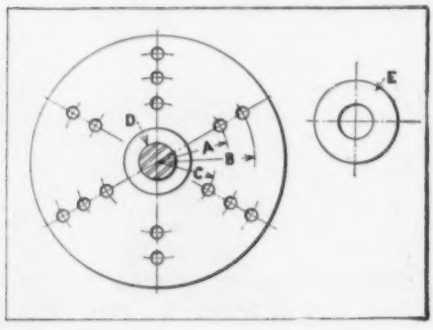
pulleys near both the spindle and the table. There is nothing unusual about the jig except that it is reversible and is driven by the table through the friction of its legs, its weight being sufficient. The table revolves at about 30 r.p.m., while the drill is run at about 3,000 r.p.m. The holes are drilled for about 5 in. from one end. Then the jig is reversed and the holes are finished from the opposite end.

This method gives sufficiently accurate results for the purpose. If more accuracy is required, either a second drill or a reamer can be put through the holes.

A Standard-Center Templet

HENRY MARTIN

In many plants, there are gears, sprockets, or flanges that must have attachment holes drilled in them. Such holes are often located at random to whatever center distance and spacing suits the occasion instead of conforming to some standard.



Considerable time can be saved in locating and drilling such holes by the use of drilling templets similar to the one illustrated, where the radial holes, as *A*, *B*, and *C* are standardized around the central hole *D*. The guide holes for the drills are arranged in circular formation for three, four, or any desired number of holes. By having a series of bushings, such as the one shown at *E*, and of the proper inside and outside diameters to slip over the stud in the hole *D* and to centralize the hole in the work, it is a simple matter for the operator to guide the drills through any single combination of holes in the templet.

Wherever it is possible, the draftsman, making the drawings of parts to have attachment holes drilled in them, should standardize on combinations of holes that will correspond to holes in the templets provided for shop use, thereby effectively arriving at the standardization of bolt holes in such items as gears, sprockets, and flanges.

SEEN AND HEARD

JOHN R. GODFREY

Anti-Friction

One sees so many mottoes and maxims in his travels that they lose much of their significance. However, here is one, seen in a New England paper mill, which seems particularly apt:

"It's friction that wears out machinery—not work.

"The same is true of people. Worry, discontent, and grouchiness are the frictions that wear us out.

"Cheerfulness, interest, and cooperation are our best lubricants.

"Let's use them."

Shaping a Flat Surface

The old single point tool still has its advocates when a really flat surface is wanted. This time it's an electrical contact for carrying a heavy current, and the contact surface is machined on a shaper and then finished with a block having an abrasive cloth surface. No other type of machine finish seems to satisfy as grinding wheels load up too easily on copper. This may seem over-fussy for a contact, but the aim is to get at least 90 per cent of actual contact.

Hydraulic Feeds in Cold Weather

One concern that is introducing hydraulic feeds on new equipment reports trouble when starting up on cold mornings. Is the shop as warm as it should be for comfort and efficiency of the men or do they need a different liquid that will flow easily at lower temperatures?

A New Kind of Haircloth

About the time we get the idea we've seen almost everything there's a new "something" pops up. This time it is a press cloth used in the hydraulic oil mills where they press the oil out of cotton seed, soy beans, peanuts, and the like. The cloth has to be strong and tough and varies from three-eighths to three-quarters of an inch thick. It isn't woven, but sort of felted, and instead of being made of vegetable fiber it is human hair from China and India. Even horse hair or camel hair do not quite fill the bill. And one firm is building up a nice little business in machinery to mend these cloths when they get thin or holey.

SHOP EQUIPMENT NEWS

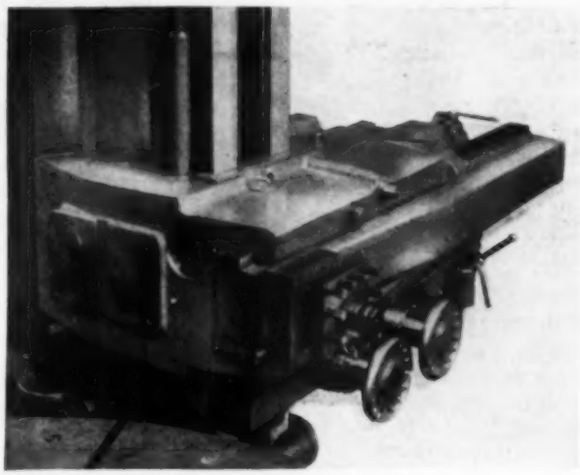
Cincinnati 96-In. "Hypro" Side Head Boring Mill

Stiffer support for the housings of the 96-in. "Hypro" sidehead boring mill, announced by The Cincinnati Planer Co., Cincinnati, Ohio, is achieved by casting the bed and its extensions as an integral unit. These extensions have a tongue to which the housings are fitted and then bolted as well. As a result, the bed is strengthened and the support for the housings is much more rigid.

Forced-feed lubrication is supplied to the faceplate spindle bearings, the track and the gearbox. A tank is located directly underneath the spindle and an individual motor-pump drive is mounted on the inner side of the left-hand housing. A pressure gage is placed so the operator can see whether or not the pump is operating. A filter is placed in the line to provide clean oil to the spindle and track.

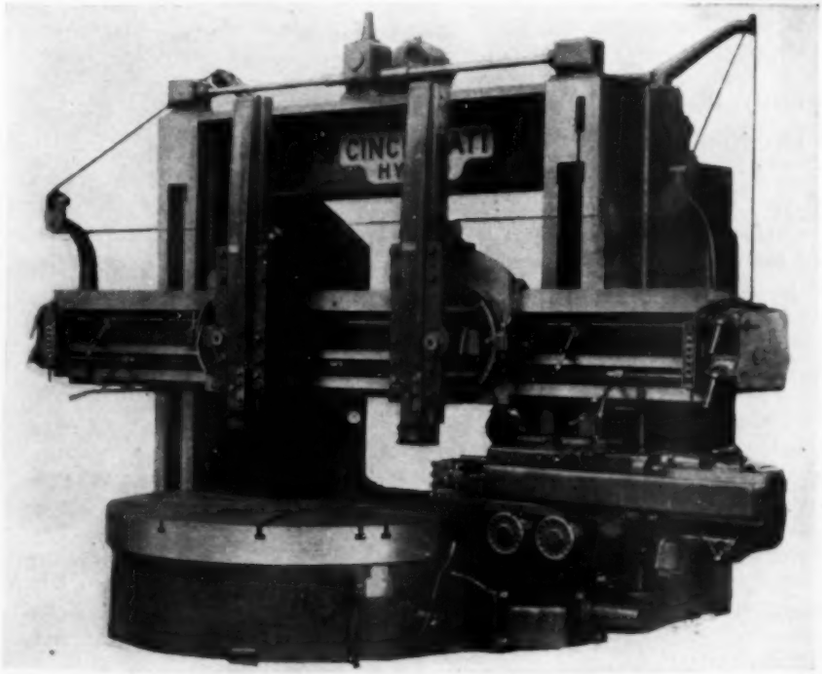
The track for the table is separate from the bed so that the track can be replaced in case of accident. The heavy deep table is driven by a steel spiral-bevel gear and pinion. Thrust of the pinion is taken by anti-friction bearings. The speed box is provided with four speed changes when using a d.c., variable-speed motor, and a triple speed box is placed on top of the four-speed box for an a.c. motor.

Each rail head is equipped with a steel ram and is lubricated from a central station. The ways of the rail are lubricated constantly. Each head can be swivelled to 45 deg. each side of center by means of a worm and segment, and a clamp is placed on top of the saddle to hold the swivel rigidly. Fine adjusting levers are supplied so that the heads can be set at any position along the rail, and these levers are placed conveniently for the operator. An electric or mechanical rail clamp can be supplied. Both designs have an interlock with the elevating motor, so that it is impossible to raise or lower the rail while clamped or partially clamped.



The side head is designed so that the ram can be placed in any position with the tool pressure always within the housing bearing

A feed box having twelve changes is placed on each end of the rail and on the side head. All gears are of chrome nickel steel and hardened. The bearings are of the anti-friction variety, and the alloy gears slide on hardened splined shafts. Gravity lubrication is used in these feed boxes. Reverse for the feed is also placed inside of the box, while an individual rapid traverse motor is located at the back of the rail for rapid traversing the head in either direction. Individual motor drive for each head enables the operator to move any one in any direction without disturbing the other. An electrical interlock is provided so that the



The bed extensions are cast integral with the bed to give stiffer support for the housings

rapid traverse motor cannot be engaged while the feed is being used.

The side head is of new design. All tool pressure is absorbed by the heavy wall on the housing, which is located about 24 in. from the face. The ram can be placed in any position, and the resultant tool pressure is always within the housing bearing. The saddle is cast with the ram clamp in place to eliminate a large number of bolts. Taper gibs provide the necessary adjustment. For feeding and rapid traversing the side head, the same type of feed box unit is placed on the back as for the rail heads. Two handwheels give final adjustment to the saddle and ram. A chip protector is placed around the side-head elevating screw, while a counter balance is placed inside the housing.

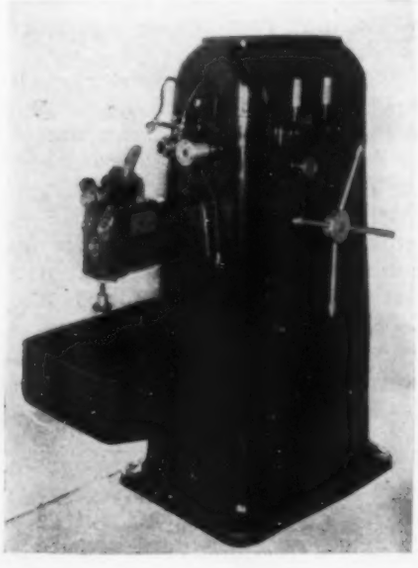
"Reading" Drilling and Tapping Machine

Drilling oil holes and drilling and tapping setscrew holes in such parts as pawls, levers, collars, and handwheels can be done on the "Reading" drilling and tapping machine announced by the Textile Machine Works, Reading, Pa. A stud such as shown on the machine or a vise jaw is sufficient for holding the part. The rate of production is high.

In the accompanying illustration it will be seen that the knee may be fed toward the spindles by means of a large handwheel. The work is mounted on a work bracket or the stud, and is swung to the right against the positive stop. After advancing the knee and drilling the work in this position, the work is swung against the left hand stop and the tap enters the drilled hole, being automatically fed by the lead of the tap.

The drilling spindle is also made to take hollow mills. Die threading can be accomplished at the tapping spindle by using a button die. Above the hand feed lever for the knee are shown two speed change levers for the two spindles. Below these levers is a button for reaming control. This button locks the tap spindle and prevents it from moving laterally. Cooling compound outlets are located above the spindles, and a large chip pan with cutting compound reservoir is located below the knee.

Specifications: Capacity—No. 32 to $\frac{5}{8}$ drills; No. 6 to $\frac{3}{4}$-in. taps; speeds, 80 ft. per min.; drill spindle, 1269, 811, 604, and 467 r.p.m.—tap spindle, 436, 278, 207 and 160 r.p.m. Lateral movement of the knee is $8\frac{1}{2}$ in., and vertical adjustment of work block, $\frac{7}{8}$ in. Over-all dimensions, 45 in. long x 22 in. wide x 52 in. high. Weight is 1,350 lb. Drive is furnished by a 1-hp. motor.



Kearney & Trecker 3- and 4-In. Inserted-Blade T-C Milling Cutters

Inserted-blade milling cutters designed for use with the cemented carbides formerly made only in a range of sizes from 5 to 14 in. diameter are now available also in 3- and 4-in. sizes from the Kearney & Trecker Corp., Milwaukee, Wis. Known as the full-back blade type, each blade is provided with a solid positive contact along the entire back face, a feature that is essential for correct application of the cemented carbides. The blades are set practically flush with the face, and chip clearance is obtained by cutting suitable slots in the body.

The body itself is made from an extra-heavy steel forging, heat-treated, hardened and ground. Each blade is made with a tapered face and is held in place by a wedge, having a corresponding taper. Uniform advance of each blade is obtained by locating pins. One pin is used for each blade, but by having a series of five

holes in each body slot and four cross slots in each blade, adjustments can be made in increments of $\frac{1}{16}$ inch.

These cutters are applicable for medium and semi-roughing, or finishing cuts. Their design is suited to milling cast irons, semi-steel, malleable irons, bronze, copper and aluminum. With tantalum-carbide cutters, they are also suitable for cutting steel.

Procunier $\frac{1}{4}$-In. High-Speed Tapping Attachment

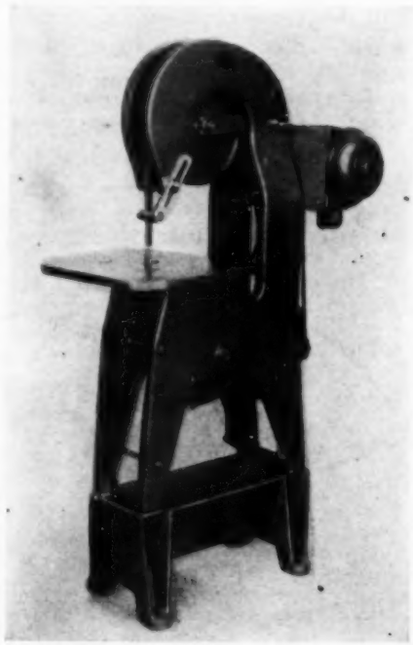
A $\frac{1}{4}$-in. super-sensitive high-speed tapping attachment, capable of tapping holes at speeds up to 3,000 r.p.m., has recently been developed by the Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill. The reverse speed is at a ratio of 2 to 1 to the tapping speed. Jar and clatter are eliminated by the "cushion-like" action of the cork clutch, and the tap slips in-

stantly if the tap strikes bottom or sticks. Ball bearings and a three-point balanced, hardened gear to reverse the mechanism are employed. The attachment is particularly useful for delicate tapping of holes up to $\frac{3}{16}$ in. in steel or up to $\frac{1}{4}$ in. in brass.

Grob Model A-2 Continuous Filing Machine

The features incorporated in the floor-type, continuous-band filing machine, known as Type A-2, and announced by the Grob Bros., 97th St. & W. National Ave., West Allis, Wis., have increased its speed and accuracy in filing and lapping of punches, dies and miscellaneous parts. These features include ball bearings throughout, a longer file back-support, higher die space, a single arm for the rubber roller guide, automatic stop for chain-tension, and a container to catch chips.

The frame of the machine consists of two side members, bolted together



by studs and mounted on a heavy base, which also serves as a container for chips. The lower portion of the side members is spaced to allow room for the driving mechanism, and the upper portion is much closer together to provide protection to the operator from the revolving chain and to increase the visibility of the work piece.

The two sheaves over which the file chain operates are approximately 13 in. in diameter. These sheaves and the reduction drive pulley are mounted on ball bearings. A positive drive of the chain is obtained through a series of equally spaced drive pins mounted in the lower sheave and matching with the links of the chain. Larger V-belts and a more powerful motor are also employed. These features, together with the positive chain drive, allow stock to be removed at a speed resembling the action of a milling cutter. Tension on the file chain is obtained through a handwheel at the right side of the machine to actuate the upper sheave through a hinged bracket. The replaceable back-support over which the files slide is hardened and ground. The files are pressed firmly to the back-support by means of a rubber-covered roller.

The tiltable work table is 17x21 in. and is adjusted by a handwheel. Fine adjustments for different angle settings are easily made. The table is 39 in. above the floor, and the space between the surface of the table and the frame is $7\frac{1}{4}$ in. Over-all height of the machine is 63 in. Power is furnished by a $\frac{1}{2}$-hp. ball bearing motor. The weight uncrated is 500 lb.

Titan Improved "Steelbac" Abrasive Disks

With the improved Titan Steelbac abrasive disks manufactured by Charles H. Besly & Co., 118-124 No. Clinton St., Chicago, Ill., the abrasive is worn down to the steel backing plate, and the plate is thrown away. This practice eliminates the necessity for building up abrasive disks and having the machine shut down while waiting for newly set-up disks to dry out.

The Steelbac consists of a comparatively thin steel plate on which the abrasive, bonded with Bakelite, is built. This grinding member is bolted to the steel disk wheel of the disk grinder. The steel plate is slightly cupped on the outer edge to confine the abrasive, and has a series of reinforcing circular and cross beads or ridges pressed into it to add rigidity. These beads or ridges serve as anchorage for the abrasive, which is furthermore cemented with a special Bakelite cement to the plate so that the possibility of breakage and cleavage is eliminated.

In Steelbacs up to 30 in. in diameter the grinding member has a series of studs, which are specially forged with a flat on one side of the head and are fitted into holes in the thin steel plates. The flat on the stud head bears against the bead of the steel plate and prevents the stud from turning. The steel disk wheel on the

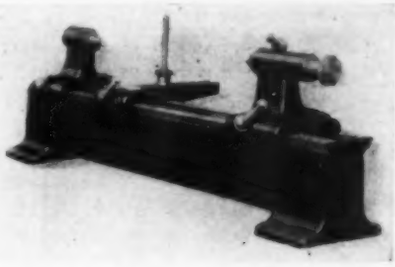
grinder is drilled to receive the studs, which are fastened by means of standard hexagon nuts. In grinding members of 42 in. and larger, the grinding surface is made up of sections. Holes are built in the abrasive sections and like holes are drilled in the steel plate. Using this section as a templet, the steel disk wheel is drilled and tapped, and the sections fastened down with case-hardened bevel-head screws. After the abrasive has worn out, the screws are removed, the sections are lifted off of the steel disk wheel and the backs thrown away. It takes but a few moments to dismount a worn-out Steelbac from the grinder and mount a new one. Either the wet or dry grinding process can be used.

Barber-Colman Bench Center

An accurate bench center has recently been announced by the Barber-Colman Co., Rockford, Ill. This inspecting tool can be used for gage-testing circular, cylindrical, and such other work as may be held on arbors, and such pieces as shafts, plugs, and others that may be held between centers. The bench center may also be used for determining the parallelism of keyways with regard to the axis of the shaft.

The bed is of ribbed box construc-

tion, with scraped dove-tail ways. The headstock and tailstock are independently adjustable, and each is fitted with a hardened and ground steel center. The tailstock has a spring-loaded center which may be clamped while a piece is held between centers. The slide, or indicator base, is provided with a vertical post which may be moved to any position in or out between centers, and is intended for use in holding a dial indicator. Other types of indicator holders are easily attached to the bench center by means of a bolt in the T-slot in the slide.

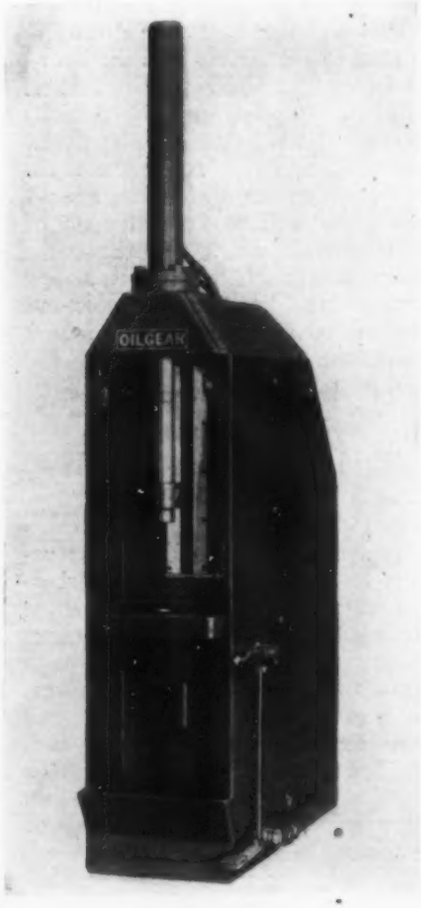


Barber-Colman Bench Centers

All movable parts of the tool are easily locked in place by ball handles on the main parts.

Oilgear Allsteel Sideplate-Type Vertical Presses

Broaching and general manufacturing operations can be carried out on the allsteel, sideplate-type vertical presses announced by The Oilgear Co.,1301-1417 W. Bruce St., Milwaukee, Wis. Only 28x45 in. of floor space is required by these presses. The heavy one-piece welded steel structure provides rigidity and alignment.

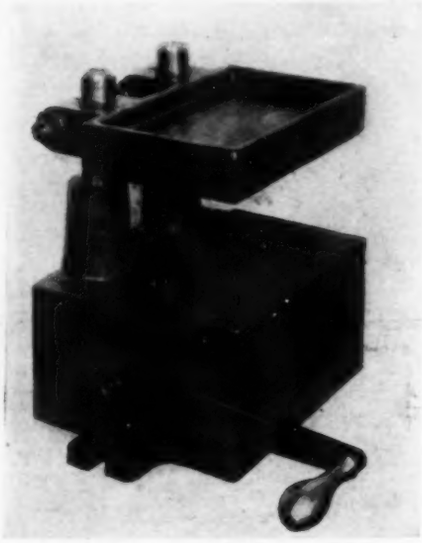


The operating mechanism for these presses includes the Oilgear Type RSA constant-displacement pump, electric motor and drive, lubricant pump, tubing and control—all inclosed in the frame structure with convenient space for making adjustments. The pump and bypass control valve are built into one small unit. Press cylinder construction includes bored and honed cylinder tube, piston-ring type piston, large ram, bronze ram guide and molded ram packing. Hand and pedal controls with adjustable-stroke limit stops are standard equipment. Single-speed, semi-automatic control is extra. Drive may be through Texropes or Dayton Cogbelts.

These presses are made in three sizes, 8, 10 and 12 tons, all having strokes adjustable from 6 to 27 in. In all cases the throat is 8 in., and the width between sideplates is 20½ in.

"Sure Clamp" Drilling Fixture

In the "Sure Clamp" drilling fixture, announced by A. H. Pearson, 7 E. Grand Ave., Detroit, Mich., left-hand operation allows the operator's right hand to be free for loading and starting feed, thereby speeding up production. However, right-hand operation is optional. These jigs combine positive locking with the additional feature of up to ¼ in. follow-up, automatically to care for variations in thickness of castings or forgings. Clamping pressures up to 1,000 lb. can be secured. The operator's fingers are protected from being crushed, because the spring



pressure does not carry the top plate down. Only movement of the operating handle does so. Each size has a range of 2 in. in adjustment, allowing for parts of various lengths, adapters, and spring pressure control.

Telechron Industrial Timer

An industrial timer for use in connection with piece rate production has been devised by the Warren Telechron Co., Ashland, Mass. The timer is turned on and off by a relay in the circuit to the motor on the machine of which the output is being timed. The relay is so arranged that, if the motor is not running or is running under light load, the timer will not operate. Increased load on the motor causes the relay to turn the

timer on, and thus the actual working time of the machine is recorded.

The dial of the timer differs from the usual clock dial in that the long hand indicates one-hundredths of an hour instead of minutes, and the short hand revolves once in ten hours instead of twelve. When the timer is in operation the dial is illuminated.

"Torsiometer" Torsion Spring Testing Machine

Torsion springs are usually mounted on shafts, flanges or arbors, and between these parts and the springs or between the coils there are frictional resistances set up which cannot be calculated with any degree of accuracy. It is important that this value be known in order that satisfactory operation of the mechanism be obtained. Therefore the Coats Machine Tool Co., Inc., 110-112 West 40th St., New York, N. Y., has placed on the market a line of torsion spring testing machines for testing such springs when they are mounted on their arbors. In the Type T-60 illustrated the spring with its arbor is chucked in the tailstock, which is then moved along the V-guides to the automatic stop and locked in position by the hand clamp. The headstock spindle has a flange with dog for connecting with the spring end, and the outer end is fitted with a weigher beam and scale. The weigher beam is suitable for right- or left-hand moments of torsion.

Test results for torsion springs are expressed in moment of torsion for a given angular twist. The spring may be weighed or tested in the process of loading or unloading; that is, the moment of torsion which a partially loaded spring will exert against further tensioning, or the moment to prevent the spring from uncoiling.

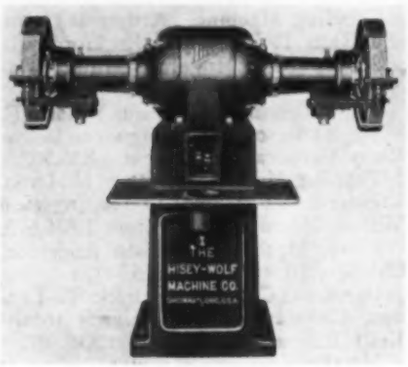
Hendey High-Speed Precision Engine Lathe

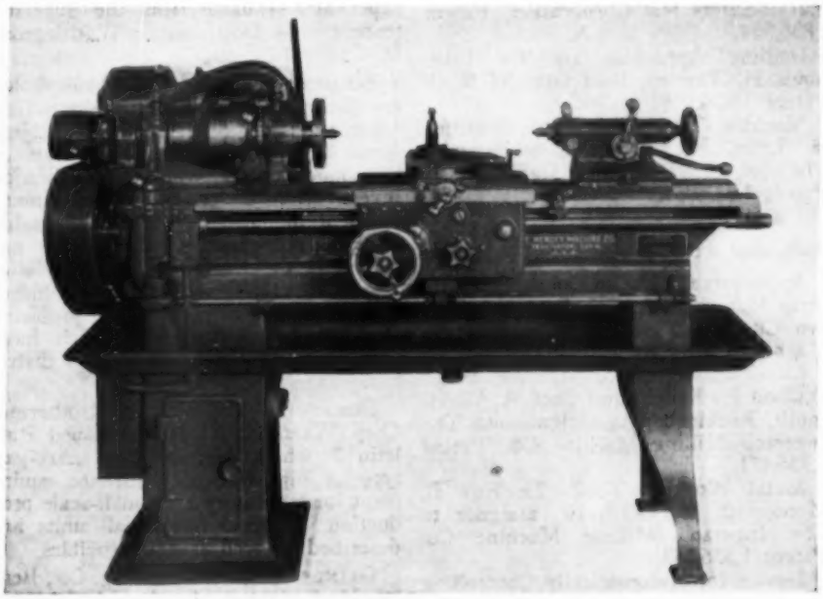
Precision turning, facing, and boring at high speeds can be done on the 12-in. engine lathe announced by The Hendey Machine Co., Torrington, Conn. This machine is said to give a fine finish through fine feeds at high work speeds with a result that approaches lapping quality. Needle valves or similar parts requiring a precision taper fit can be turned with both feeds engaged.

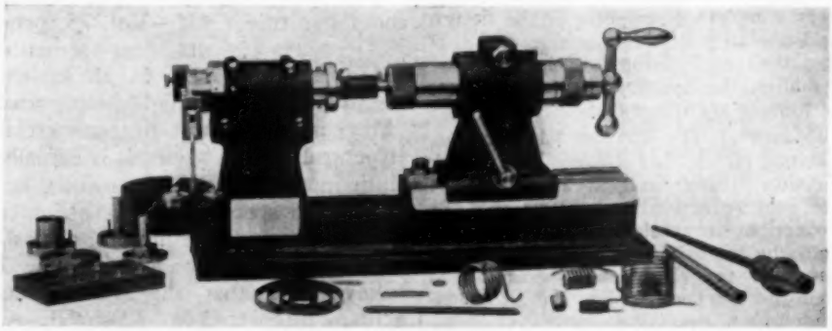
The spindle runs in precision preloaded ball bearings, both front and rear. Normal spindle speeds with a four-step cone are 455, 775, 1,200 and 2,000 r.p.m. The feeds, both longitudinal and cross, approximate 1,600 per in. or 0.000625 in. per revolution of the spindle. Finer or coarser feeds can be obtained, and the feeds are reversible. Collets with a maximum capacity of $\frac{5}{8}$ in. can be furnished. Such collets can be lever-operated without stopping the spindle. The tailstock spindle has a quick release by lever for removing or placing the work between centers. A hand-operated friction brake for the spindle is furnished.

"Hisey" Wide-Swing Floor-Stand Grinders

Wide-swing floor-stand grinders, which are particularly suitable for grinding large and irregular shaped pieces, have been placed on the market by the Hisey-Wolf Machine Co., Cincinnati, Ohio. These machines are made in $2\frac{1}{2}$- and $3\frac{1}{2}$-hp. sizes, and are equipped with four ball bearings mounted in the end caps in close proximity to the wheels. These bearings are inclosed and protected from dust and grit. Timken roller bearings are optional equipment without extra charge. The motor is supplied for single phase, or two and three phase, a.c. circuits or for d.c. circuits.







PATENTS

DECEMBER 15, 1931

Metal-Working Machinery

Automatic Shaper Feeding Device. Hubert C. Morris, Albany, Oregon. Patent 1,836,036.

Internal Lapping Machine. Herbert Stuart Indge, Westboro, Mass., assignor to Norton Co. Patent 1,836,121.

Gear Cutting Machine. Homer C. Warner, Cleveland, Ohio, assignor to The Lees-Bradner Co. Patent 1,836,210.

Grinding Machine. Arthur H. Lyon and Hans T. R. Hanitz, Rockford, Ill., assignors to The Ingersoll Milling Machine Co. Patent 1,836,482.

Metal Bending Apparatus. Lora E. Poole, Anderson, Ind., assignor to Delco-Remy Corporation. Patent 1,836,502.

Tapping Machine. Arthur H. Lyon, Rockford, Ill., assignor to The Ingersoll Milling Machine Co. Patent 1,836,675.

Filing Machine. William Anderson, Chicago, Ill. Patent 1,836,741.

Grinder (Cutter). Patrick T. Lennon, Cleveland, Ohio, assignor to the Kelly Reamer Co. Patent 1,836,807.

Metal Working Machine. George F. Bryant, Chicago, Ill., assignor to Marye Safety Nut Corporation. Patent 1,836,954.

Drilling Apparatus and the Like. Louis H. Thullen, East Orange, N. J. Patent 1,836,998.

Machine Tool (Tapping). Arthur H. Lyon, Rockford, Ill., assignor to The Ingersoll Milling Machine Co. Patent 1,837,054.

Tools and Attachments

Apparatus for Use in Connection with Strip Material. Adolph Potdevin, Garden City, N. Y., assignor to Potdevin Machine Co. Patent 1,836,279.

Chuck Assembly for Machine Tools. Willson H. Knight and Cecil A. Waldsmith, Rockford, Ill., assignors to The Ingersoll Milling Machine Co. Patent 1,836,471.

Metal Working Tool. Le Roy B. Monosmith, Rockford, Ill., assignor to The Ingersoll Milling Machine Co. Patent 1,836,543.

Device for Automatically Controlling the Slide Rests of Lathes and Machine Tools. Georges Cuttat, Paris, France, assignor to Societe Anonyme des Etablissements Cuttat, Paris, France. Patent 1,836,648.

Cutter Truing Device. Ernest C. Head, Rochester, N. Y., assignor to Gleason Works. Patent 1,836,662.

Rotary Milling Cutter and Like Tool. Herbert Stuart Walker, Birmingham. England. Patent 1,836,737.

Fluid Pressure Tool. Edward W. Stevens, Detroit, Mich., assignor to Chicago Pneumatic Tool Co. Patent 1,836,779.

Apparatus for Roller Spun Metal Manufacture. William R. Harrison, Massillon, Ohio, assignor to The Spun Steel Corporation. Patent 1,836,921.

Chuck. Harry E. Sloan, Hartford, and George A. Highberg, West Hartford, Conn., assignors to The Cushman Chuck Co. Patent 1,837,174.

TRADE PUBLICATIONS

BELT DRIVES. The Engineering Experiment Station of Ohio State University, Columbus, Ohio, has issued Bulletin 62 entitled "Belt Drives with Cast-Iron Pulleys and with Paper Pulleys." Investigation was made of the transmissive power of oak-tanned leather belts and rubber belts, particularly at small angles of contact, on these two types of pulleys. Twenty-five graphs are included in the text.

CHROMIUM PLATING. The U. S. Department of Commerce, Bureau of Standards, has issued Research Paper No. 368 entitle "The Porosity of Electroplated Chromium Coatings." Porosity of the coating decreases with increase in bath temperature, but increases with current density. Copies of the paper are available from the Superintendent of Documents, Washington, D. C., for 10 cents.

ECONOMIC REPORTS. The Policyholders' Service Bureau, Metropolitan Life Insurance Co., 1 Madison Ave., New York, N. Y., has issued an "Index of Economic Reports" which lists the major investigations undertaken on better management in business, and also contains references to articles which have appeared in the *Executive Service Bulletins*. About 500 subjects are included. More than 100 new studies on problems of business management, which have been made available for general distribution, are now included.

FURNACES. The Ajax Electrothermic Corp., Trenton, N. J., has issued Bulletin 7, which describes the spark-gap type of high-frequency furnace equipment for laboratory and small-scale production. Several new small units are described, as well as new crucibles.

GRINDERS. The Covel Mfg. Co., Benton Harbor, Mich., has issued a circular on its No. 78 surface grinder, giving a very complete description of the design and operation of this machine, and listing the specifications. Important assemblies, the hydraulic system, and attachments are illustrated.

MOTORS. The Master Electric Co., Dayton, Ohio, has issued Data Book Section 210, on its geared-head motors for gear reduction or acceleration. The reduction or acceleration unit is built into the motor housing. Many typical products to which these geared-head motors have been applied are also illustrated.

RESISTANCE TO WEAR OF CARBON STEELS. The U. S. Department of Commerce, National Bureau of Standards, has issued Research Paper No. 348 entitled "The Resistance to Wear of Carbon Steels" as determined by the Amsler machine. The publication is for sale by the Superintendent of Documents, Washington, D. C., for $0.10.

QUENCHING MEDIA. The U. S. Department of Commerce, National Bureau of Standards, has issued Research Paper No. 357, entitled "Aqueous Solutions of Ethylene Glycol, Glycerin, and Sodium Silicate as Quenching Media for Steels." Only the sodium silicate was found to be particularly satisfactory as a quenching media. Copies of the paper are for sale by the Superintendent of Documents, Washington, D. C., for $0.15.

TORQUE MOTORS. The Ohio Electric Mfg. Co., 5900 Maurice Ave., Cleveland, Ohio, has issued Bulletin 208 on slow-speed torque motors or rotating magnets, which have ability to stall across the line. Applications include closing and holding closed electrical contactors, valve stems and locking or clamping devices.

VALVES. The Reading-Pratt & Cady Co., Inc., Bridgeport, Conn., has issued a 16-page book on its Lubrotite gate valve, which differs from the ordinary gate valve in that it has a duct system for introducing a lubricant-seal between the seating surfaces.

VANADIUM STEELS. The Vanadium Corp. of America, 120 Broadway, New York, N. Y., has re-issued specification sheets 3B to 9B, inclusive, on vanadium steels for locomotive castings, railway springs of various types, and automobile springs.

VALVES. The Homestead Valve Mfg. Co., Inc., Coraopolis, Pa., has issued a complete reference book on valves, containing 48 8½x11-in. pages.

■

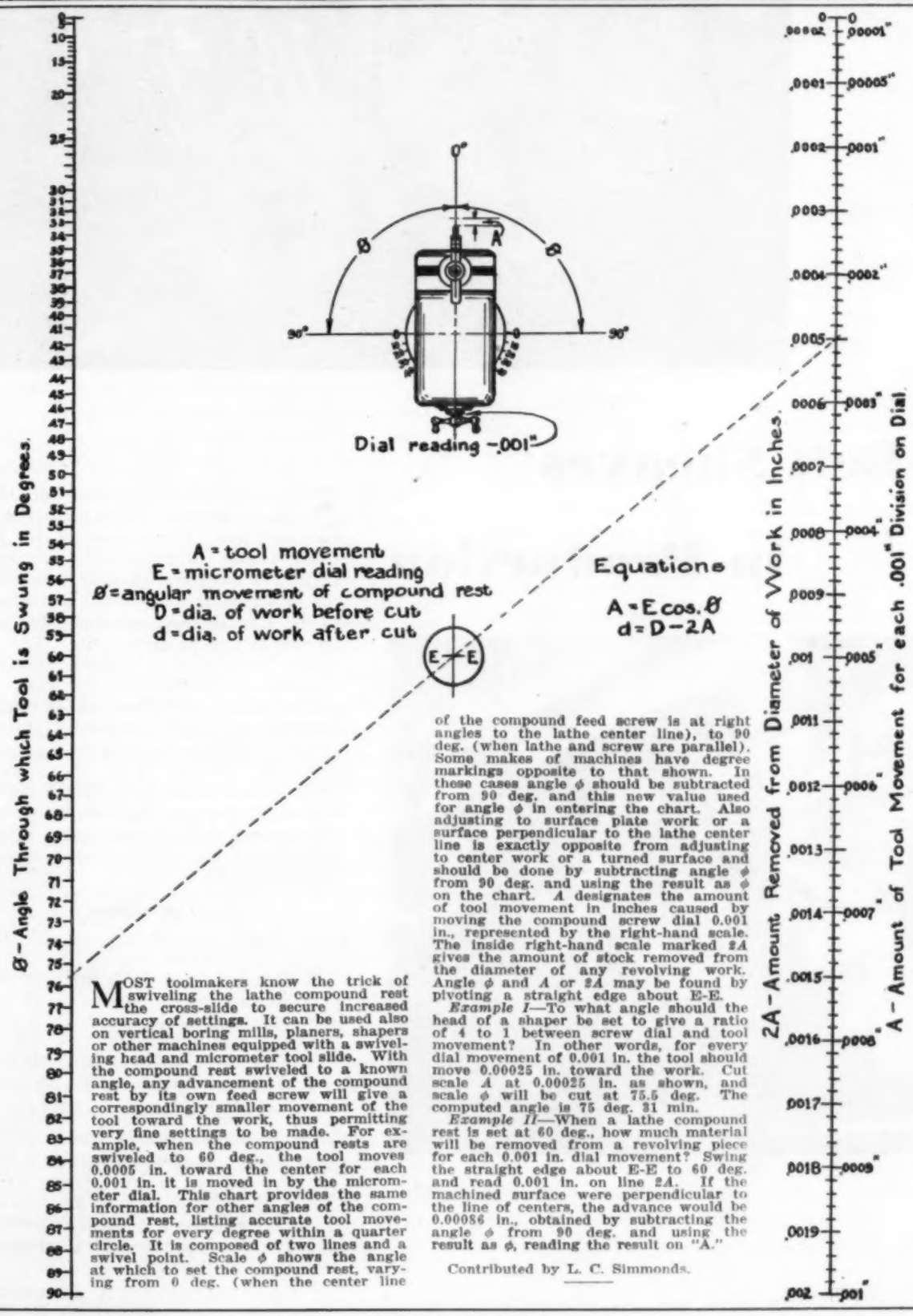
Magnesium and Its Alloys
Correction

GEORGE H. COOPER
Consulting Engineer

The Reference Book Sheet under the above title (*AM*—Vol. 75, page 795) states in its first sentence "Magnesium, lightest of all known metals," etc. This might better read "Magnesium, lightest of commercial structural metals," since it is actually sixth in the list of light metals, according to specific gravity. Lighter than magnesium are lithium, potassium, sodium, rubidium and calcium. I believe also that magnesium was actually discovered in 1829 by Bussy.

Reference Book Sheet

INCREASING ACCURACY BY SWIVELING A TOOL SLIDE


Ø - Angle Through which Tool is Swung in Degrees.
2A - Amount Removed from Diameter of Work in Inches.
A - Amount of Tool Movement for each .001" Division on Dial
0°
90°
90°
Dial reading -.001"
A = tool movement
E = micrometer dial reading
Ø = angular movement of compound rest
D = dia. of work before cut
d = dia. of work after cut
Equations
A = E cos. Ø
d = D - 2A

MOST toolmakers know the trick of swiveling the lathe compound rest the cross-slide to secure increased accuracy of settings. It can be used also on vertical boring mills, planers, shapers or other machines equipped with a swiveling head and micrometer tool slide. With the compound rest swiveled to a known angle, any advancement of the compound rest by its own feed screw will give a correspondingly smaller movement of the tool toward the work, thus permitting very fine settings to be made. For example, when the compound rests are swiveled to 60 deg., the tool moves 0.0005 in. toward the center for each 0.001 in. it is moved in by the micrometer dial. This chart provides the same information for other angles of the compound rest, listing accurate tool movements for every degree within a quarter circle. It is composed of two lines and a swivel point. Scale ϕ shows the angle at which to set the compound rest, varying from 0 deg. (when the center line of the compound feed screw is at right angles to the lathe center line), to 90 deg. (when lathe and screw are parallel). Some makes of machines have degree markings opposite to that shown. In these cases angle ϕ should be subtracted from 90 deg. and this new value used for angle ϕ in entering the chart. Also adjusting to surface plate work or a surface perpendicular to the lathe center line is exactly opposite from adjusting to center work or a turned surface and should be done by subtracting angle ϕ from 90 deg. and using the result as ϕ on the chart. *A* designates the amount of tool movement in inches caused by moving the compound screw dial 0.001 in., represented by the right-hand scale. The inside right-hand scale marked *2A* gives the amount of stock removed from the diameter of any revolving work. Angle ϕ and *A* or *2A* may be found by pivoting a straight edge about E-E.

Example I—To what angle should the head of a shaper be set to give a ratio of 4 to 1 between screw dial and tool movement? In other words, for every dial movement of 0.001 in. the tool should move 0.00025 in. toward the work. Cut scale *A* at 0.00025 in. as shown, and scale ϕ will be cut at 75.5 deg. The computed angle is 75 deg. 31 min.

Example II—When a lathe compound rest is set at 60 deg., how much material will be removed from a revolving piece for each 0.001 in. dial movement? Swing the straight edge about E-E to 60 deg. and read 0.001 in. on line *2A*. If the machined surface were perpendicular to the line of centers, the advance would be 0.00086 in., obtained by subtracting the angle ϕ from 90 deg. and using the result as ϕ, reading the result on "A."

Contributed by L. C. Simmonds.

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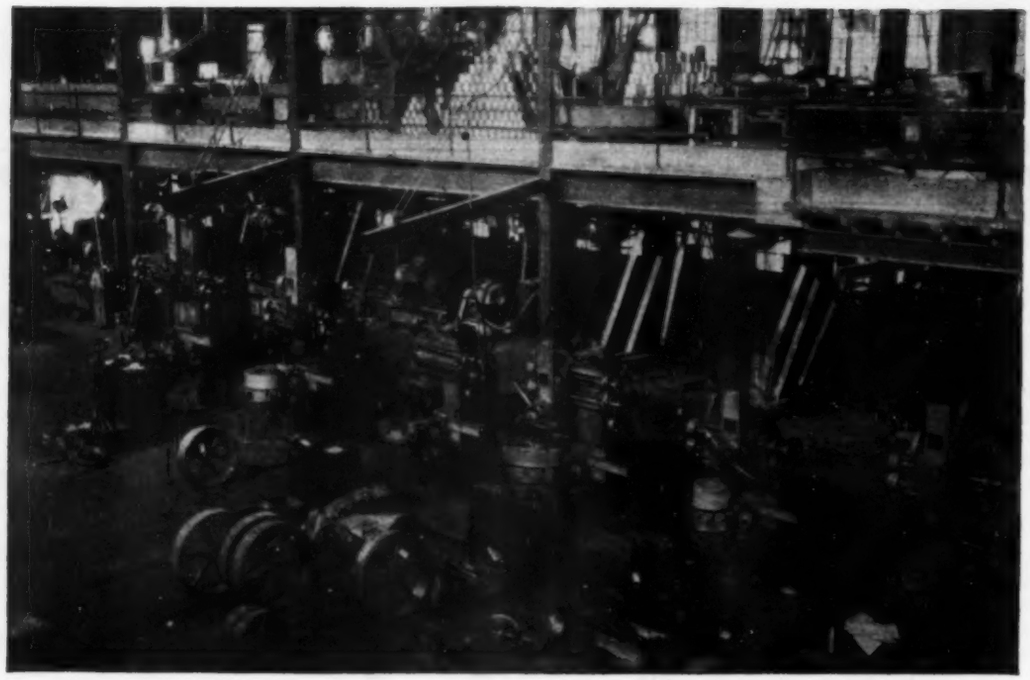
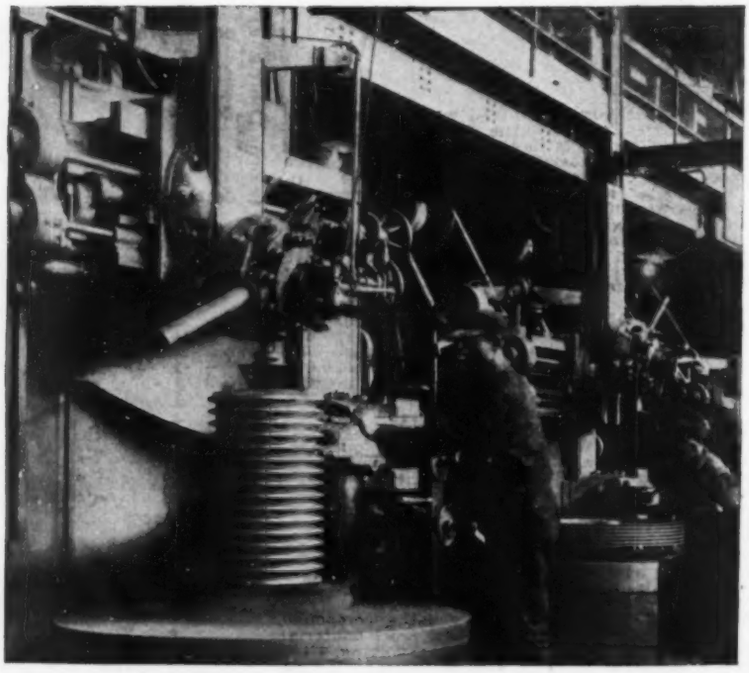


V-Belt Sheaves in Production



SUCCESSFUL operation of V-belt sheaves depends largely upon the accuracy with which the grooves are cut. Hence when Dodge Manufacturing Corporation decided to bring out a line of V-belt drives, the management did not use a single piece of the existing shop equipment, but bought an entirely new production line. This eliminated inaccuracies in machine elements as a source of inaccuracy in the work.

The general view shows six of the seven vertical turret lathes installed to do all the turning and groove cutting on medium- and large-size sheaves. Two jib cranes with ½-ton electric hoists serve five of the larger machines. Smaller-size sheaves are turned and grooved on horizontal turret lathes under the balcony. Keyseating equipment is also located there.

Operations

1. Rough turn O.D. with side head tool; face one edge
2. Rough bore with flycutter or turret
3. Reverse pulley on chuck and finish bore with flat bit; finish O.D. of rim and face other edge
4. Ream bore, chamfer inside of rim
5. Rough and finish cut V-grooves
6. Cut keyway

As V-grooves are cut from the solid, it is necessary in deep grooves first to gash the rim with a straight groove tool, followed by a finish form tool. Speeds and feeds are reduced to prevent distortion that might result from excessive heat otherwise developed at the tool.

AMERICAN MACHINIST

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

New York, December 24, 1931

VOL. 75 NO. 26

Merry Christmas

It is hard to make merry over Christmas when millions of men and women and children are going hungry. But despite Walter Lippmann's warning that we "are in the presence of events of such surpassing magnitude and complexity that certainty is the trade mark of a fool," we submit that Christmas could certainly have been made far merrier for many of these millions this year. Though thousands of industrialists, merchants and bankers have done their utmost to relieve conditions, it is plain fact that even more thousands have had neither the common sense nor the good will to lift a bored finger for themselves, their dependent employees and ex-employees, or their country.

But there is increasing evidence that even these guilty thousands are shaking themselves out of their fool's paradise. Though their impelling motive may be stark selfishness rather than Christian good will, they now realize that they must bestir themselves and their businesses mightily during the three months between now and Easter or drop out of the business picture. With the sincere and single-minded cooperation of every individual business, business man and worker, with the good will that should bridge over each year's gap from Christmas to Christmas, we shall all be able to wish each other an unqualified Merry Christmas in 1932.

Simple Jobs First

Just this week one of our good friends from the Middle West visited our shop, a man whom we would like to see much oftener. Like the members of our own staff, this man visits a good many manufacturing plants every year, and we enjoy swapping experiences. Inevitably in the course of conversation we came upon the subject of the twin carbides, tungsten and tantalum.

One of us asked him a question point blank—"Why haven't these wonderful cutting materials come into more general use?"

"Well," he said, "I may not have the whole answer, but I think I ran into part of it the other day. One of my customers was telling me that he had a tough job for the next T. C. sales engineer who came around and that he'd bet the engineer couldn't lick it. I suggested that it might not be such a bad idea for him to give the materials a fair trial on the simple jobs first, ones he knew he could lick himself. He could then develop his own technique and be ready for the really tough ones when it came their turn."

Every cutting material has its legitimate place in metal working—diamond, tungsten carbide, tantalum carbide, Stellite, high speed steel, carbon steel. The real job is to find where each works to best advantage in each individual shop.

How Much More?

President Hoover's tax plan has intensified a controversy that was already going strong. All shades of opinion are expressed—some contend that the President has gone too far, others opine he hasn't gone far enough. The only point obtaining general acceptance is that more revenue must be raised somehow. The line of cleavage is on how quickly the budget should be balanced.

The President's plan is premised on the basis of two and a half years. More conservative opinion is that the budget should be balanced for the coming fiscal year as a sound financial policy and as an example to business and individuals. With an estimated deficit of two billion dollars this year, such a policy would call for a drastic tax rise. But this "pay-as-you-go" program, its proponents contend, will supply an effective brake on Congressional expenditures.

However, there is another side to the picture.

Business has been repeatedly urged by governmental and other advices to plan on a five- or ten- instead of on a one-year basis. This means the building up of adequate surpluses in prosperous years to maintain an even dividend policy in times of reduced earnings. If this advice is good for business, why not for the government too?

In the boom period, government issues were retired at the rate of four billion dollars annually in excess of legal requirements. This action may logically be regarded as creating a reserve of borrowing capacity. Instead of attempting to make up the full amount of the Treasury Department's deficit by high imposts, new issues may be used to balance partly this excess retirement.

If any agency can adopt successfully the much acclaimed regularization policy, it should be the government. In good times, let it collect, as it did, income in excess of its current requirements. Use this to pay off outstanding indebtedness if the temptation of a large cash reserve will be too much for the Congressional appropriation enthusiasts. But then let it not fall into the error of the timid board of directors, which having accumulated just such a backlog, is afraid to make practical use of its sound financing when profits diminish. The Government should now employ its borrowing capacity to relieve the burden on business and individuals when they can ill afford the load of additional levies.

◂◂ CHIPS ▸▸

President Hoover secures a pledge of prompt action on the moratorium from Congressional leaders . . . At the same time, the Senate Committee on Foreign Affairs votes to postpone consideration of entry into the World Court "until pressing economic matters are disposed of" . . . House Committee on Ways and Means virtually serves notice that there will be no war debt revision this session . . . With these expressions of good will to all men, the Congress adjourns for the Merry Christmas holidays.

December directory meetings seem to be saying it with passed dividends . . . Bethlehem Steel agrees to take care of its own unemployment situation at the Lackawanna plant . . . Presidents of major Eastern railroads appoint committee of three with plenary power to negotiate a wage rate settlement with the union leaders . . . Tentative date for the conference is December 28 . . . U. S. had a favorable trade balance of 43,000,000 dollars in November . . . A certain firm is about to announce the sale of electrical annealing furnaces on the installment plan . . . The N. Y. Stock Exchange releases its list of short sales . . . and many men will say there ought to be a law . . . Pierce-Arrow forms a Canadian subsidiary to manufacture a complete line of cars . . . retaliatory tariffs are clearly to blame . . . Superior Die Casting operates its toolroom at full time and its shop at half capacity . . . indicates small lots and frequent changes in design . . . President Hoover gives 5,000 dollars to the Professional Engineers' Committee on Unemployment.

A League of Nations commission has advised China to spend $1,120,000,000 for machinery as a part of a 10-year industrialization program proposed by the commission. Coal output is to be jumped from 30 to 200 million tons a year, horsepower capacity of industry from 1,750,000 to 20,000,000. A model machine building plant where machinists can be trained is to be established in Nanking. The site has been chosen, and the cost is to be over $3,000,000. Chinese experts are to go to England for special training to be ready to supervise the erection of the British equipment that is to go into the plant. Needless to say, England was adequately represented on the commission. The Nanking government has not as yet approved the commission proposal. Must have something else on its mind.

Although the stock market would indicate that the bottom is dropping out of American business, November electrical power consumption figures show an encouraging upturn in the metal-working industry . . . The Kearny plant of Western Electric adds 200 more men to take care of increased Teletypewriter business . . . all family men . . . Auburn places orders for more than 11,000,000 dollars worth of materials for first quarter production . . . Reo truck sales have been showing increases every month for the last four months . . . Allis Chalmers receives a 1,000,000 dollar order from the Pennsylvania Railroad . . . Union Carbide & Carbon will resume capacity operations at its Sault Ste. Marie plant, January 1 . . . Republic Steel is to resume operations on eight of the eighteen sheet mills comprising its Niles plant . . . Railway Express Agency cuts air express rates . . . A package which formerly cost ten dollars for shipment from New York to Chicago will now cost less than five . . . Timken-Detroit oil burner sales are running

a third over 1930 sales . . . and 1930 sales were 56 per cent greater than those of 1929 . . . Contrary to all expectations, at least two steel producers will be found well in the black for 1931.

The reparations experts at Basle seem to be uncovering certain dynamite-filled facts regarding Germany's financial situation . . . Her export balances are being found more than sufficient to pay "the unconditional reparations annuities" of 157,000,000 dollars . . . Germany claimed she is subject to annual interest charges of 450,000,000 dollars on foreign debts . . . the experts are finding them to be 112,500,000 dollars less . . . Short term indebtedness appears to be nearer 1,850,000,000 dollars than to the 3,000,000,000 claimed . . . With such a showing plus the dangers of Hitlerism, France is going to be slow to consider disarmament . . . The British Government denies the reported suspension of naval construction . . . adds more bricks to its new tariff wall . . . The Sino-Japanese War seems to be approaching a stalemate.

THIS WEEK IN *AM*

Were it physically possible for us to show you the many approving letters received, you would understand our regret at bringing the *American Machinist* Awards series to a close. One large and powerful association has asked permission to abstract every brief for its members; companies not at all connected with any of the entrants have sought reprints for distribution to customers.

"Diversified Replacement in a Small Plant" (page 946) is the last, but obviously not the least, of the eight finalist briefs to be published in alphabetical order by classes. How Rotor Air Tool Company extended its replacement policy to jigs and fixtures and office equipment is only one of the revealing things described by D. S. Linton, production manager. As was suggested last week, take an hour off and read it thoroughly.

"Hand to Mouth" is the Executive Forum subject for the week (page 954). Might we suggest that you join the discussion on present methods of pinch-penny industrial purchasing? It has much to do with the present manufacturing situation, and we would like to have your views. "A Special Machine That Paid for Itself" describes a privately built vertical milling machine that reduced machining time by 90 per cent (page 957). The author, R. E. McCoy, prefers to withhold his company connection. "Controlling Field Erection Costs" (page 960) reveals the actual methods and forms used by R. Hoe & Co., Inc.

Some time ago we published a series by Ken G. Niblack, of Bausch & Lomb, under the general title of "Optics in Metal Working." Since then he has secured material on practical shop applications of the bevel protractor and the optical indexing device, and we present it under the same title (page 962). We understand that the whole series may be published in book or booklet form.

It is one thing to make and another to manufacture sheaves for V-belts. That Dodge Mfg. Corporation is on a genuine production basis will be seen in "V-Belt Sheaves in Production" (page 980). "Increasing Accuracy with a Swiveling Cross-Slide" (page 979) is the Reference Book Sheet. L. C. Simmonds has done an excellent job in graphing an old shop trick for wider use.

• COMING •

Whether we want to be mixed up in it or not, every man, woman and child in the world is affected by the economic order of things. In America we are taunted by less fortunate beings for living under an economic state known as capitalism. Not so long ago some of us, not realizing how it would react on all of us, went through a drunken speculative orgy known as a boom. Few there be who have not been fellow sufferers from the hangover. But speculation is not the only cause of one of the most devilishly baffling depressions in history. Starvation in the midst of plenty is a new thing.

When a man subscribes for *American Machinist,* we agree to furnish him with 52 issues per year of the best and most up-to-date production, engineering and management material that we can uncover or initiate. But this year we happen to have 53 Thursdays, hence 53 issues. Since every man Jack of us is part and parcel of the economic order and should be bound, by self interest if nothing else, to do everything in his power to expedite recovery, we decided to dedicate the issue of December 31, to Economics, spelled with a big E. In it for you to take or leave, we shall publish the best thought of a manufacturer, a banker and an economist. Perhaps you will not wish to remove the wrapper, but you will be doing an injustice to yourself, your family, your company and your country if you do not read and ponder every word.

Progress in Metal-Working and Machinery Markets

FAIRLY general quiet marks the usual year-end decline in machinery and machine tool sales, although isolated dealers, manufacturers or districts report a better December . . . As predicted last week, the N.M.T.B.A. index of machine tool orders rose from October's 44.5 to 50.8 for November, though the three-month average dropped seven points to 50.4 . . . Class A plants (more than $50,000 annual shipments, 1922-24) showed a 10-point increase to 50.1, Class B ($10,000-$50,000) a decline of 5 points to 54.7, and Class C (Less than $10,000) a drop of 8 points to 46.7 . . . Shipments dropped 35 points to 49.0, unfilled orders lifted a point to 97.3.

TWO or three New York dealers are busy, one with December better than November, another selling 3 lathes and some brakes and shears . . . Bids on four radials for the Brooklyn Navy Yard were opened Dec. 15 . . . Cincinnati holds even, in development of prospects . . . New England has a small order for grinding machines, the only repercussion of the step-up in automobile production thus far noted; used equipment goes poorly . . . Chicago inquiries are decreasing, little business appears in the offing until well into next year, prospects depend more on automobile demand than anything else, and used tool demand is slow . . . Indianapolis feels about the same, although radio plants are buying and Auburn has just bought $2,000,000 worth of materials.

DETROIT sees no effect of stepped-up automotive production . . . Opinion is divided regarding the time when sales may be expected, some say soon, some not until well into 1932 . . . Canadian sellers are fairly busy, with an upward trend in general manufacturing and a seeming benefit from the new tariffs . . . Pacific Northwest inquiry is quiet, only small tools going to any extent.

NEW YORK

One dealer will have a December better than November as a result of closing some old inquiries. Another sold three lathes, some power brakes and some shears last week, as well as developing several good prospects. Still another is fairly busy. Other dealers noted no change, except for one or two who had a poorer week as the normal holiday quiet sets in. Bids on four radials for Brooklyn Navy Yard were opened Dec. 15, but the awards have not yet been announced.

CINCINNATI

Machine tool manufacturers note no change in demand. Some encouragement is given by statements that concerns in the automotive field are developing buying programs. Selling agents are having some success in developing prospects, but they are closing but few orders.

NEW ENGLAND

"Nothing stirring!" is the caustic comment that speaks volumes for the machine tool situation. However, a Middle West manufacturer placed an order for a small number of grinding machines, which, as far as can be learned, represents all that has happened from the more recent automotive inquiries. Used equipment dealers are supplying an occasional replacement unit and repair parts, but report dull business with the total sales volume a goodly percentage below normal. The City of Boston received bids Tuesday for 23 rigid non-reversible blade plows.

CHICAGO

As the end of the year approaches inquiries for machine tools are decreasing. No development indicating even a slight improvement in the demand for metal-working tools until 1932 is well advanced has taken shape, and duller conditions than those now prevailing have not been experienced in years. Prospects for the near future seem to depend more on the automobile industry than on any other specialized line. Little is expected from western railroads, at least until inventory taking is completed and a thorough examination into replacement needs is made, and it is reported to be doubtful whether farm implement builders will approach the market for many weeks to come. Business in used tools continues on a negligible basis.

INDIANAPOLIS

The machine tool trade is expecting virtually no business now until after the first of the year. During the holiday period several factories will suspend operations for the annual inventory taking, and any purchases they may be expected to make will be deferred until after that time. Things are not all black, however. The radio business is prosperous, apparently, overtime shifts being the rule. The Auburn Automobile Co. has just awarded contracts amounting to more than $2,000,000 to various Indiana enterprises for materials during the first quarter of the new year. Many of these plants will be compelled to buy some new equipment.

DETROIT

Increased automobile production has thus far had little effect on the sales volume in machinery and machine tools. Automobile and accessory manufacturers are working on new models and have made a noticeable spurt in production. They have employed large numbers of men who have been out of work for months, have revamped their plants and have made numerous changes in machinery. But they have not yet been called upon to make any large purchases of equipment. One outstanding dealer said he has made certain that the machinery trade will not feel the advance here until several months have passed. Another believes the trade will receive some orders for equipment when the contract jobbing shops begin to get steady and profitable work from the automobile plants.

CANADA

Machinery requirements for plant extensions, orders for equipment for entirely new enterprises and replacement orders all combine to keep machinery and machine tool manufacturers fairly busy. Since the imposition of higher tariffs last spring hundreds of new manufacturing enterprises have been established, particularly in Eastern Canada, and these are gradually expanding their operations with consequent demands for new equipment. In addition, there is a distinctly upward trend in manufacturing generally. Preliminary reports point to an expansion in the steel industry during the early part of December and to preparations for an increase in automobile production. There are some weak spots, however. The iron market shows little activity and the general foundry trade continues but moderately employed. On the other hand, general construction contracts are of fair volume.

PACIFIC NORTHWEST

The off-season for machine tool and shop equipment houses is intensified by general conditions. At the moment there is scarcely any movement. Some lines are optimistic of improvement after the turn of the year, based on recent inquiries, while others consider the outlook uncertain. Industrial inquiry continues dormant; nearly all purchases are governmental. Dealers in tractors and highway machinery have profited by large public works. Jobbers' stocks are at extreme low ebb. Canning industries are making no replacements, and next year's operations are somewhat uncertain. Lumber is in the doldrums but there are prospects for some replacements of lumber manufacturing machinery. Except for precious metals, mining is at a standstill. Gold properties are operating, and there is a fair volume of business with small prospectors.

WEEK . BY . WEEK

BUSINESS BAROMETER

Trends in General Business throughout the world

THEODORE H. PRICE
Editor, Commerce and Finance, New York

"Words are things" and the bankers of the world ought to erect a monument to the man who invented the phrase "frozen assets." It has saved many banks from insolvency because it has enable them to secure the time required for liquidation, and it will probably be given a permanent place in our vocabulary of finance. The same thing might be said of what are humorously described as "slow burning notes" which some bankers hold in their portfolios, and President Hoover has just coined a third phrase that will be frequently used during the year 1932. It is "revising reparations" and opens the door to a discussion that will occupy the attention of most business men during the year upon which we are shortly to enter.

The writer is not in favor of inflation, but there are some conditions whose advent we cannot oppose, and must make the best of. Worldwide inflation is one of these conditions, and its spread was indicated last week by the appointment of a Japanese Ministry that has put an embargo upon further shipments of gold out of Japan. The action thus taken means that Japan will impound all the gold over which it can exercise any control, and that France and the United States will be left practically alone in maintaining the gold standard to whose support most of civilization was formerly committed.

Whether the two nations named can sustain the burden they have assumed remains to be seen.

Prophecy is Hazardous

Prophecy in the face of such a complex situation is hazardous and largely conjectural. There are, however, one or two phases of the outlook that are attracting public attention very definitely, and should be carefully considered by all thoughtful business men.

One is the need of a standard of value that will be permanently acceptable to all the world, and the other is an agreement that civilization can and will accept in regard to the payment of reparations.

The impossibility of living up to either the Dawes Plan or the Young Plan is becoming more evident every day, and it is plain that many conferences must yet be held before a satisfactory understanding with regard to reparations can be arrived at.

Hence Mr. Hoover's phrase about "revising reparations" was seized upon as indicating the popular attitude toward the problems involved. There is, however, less insistence than there was upon an immediate settlement of the many vexing questions that are involved, and it has been suggested that an agreement may be reached some sixty years from now when our children's children will be in the saddle, and the indebtedness resulting from the war will be forgotten and perhaps forgiven.

Banking Rearrangement Needed

The report of the Comptroller of the Currency to Congress is one that emphasizes the need of a thoroughgoing re-arrangement of our banking machinery. In this report the Comptroller called attention to the fact that there were 2,342 bank suspensions in the United States during the twelve months ending Sept. 30, 1931. The suspended banks had deposits amounting to $2,008,729,000. Since the report was compiled many other banking institutions have been compelled to suspend temporarily or permanently. In Massachusetts, on Dec. 15, nine banking concerns with deposits of $58,700,000 joined the list of those who were temporarily embarrassed. Four more in the same state followed suit on the 17th. An early resumption of business is predicted by their officers, but their suspensions caused great discouragement, and it is remarkable that its influence upon stock exchange prices was not greater.

A change of attitude on the part of the public is, however, distinctly noticeable. The feeling of pessimism is less general than it was, and stories of business improvement are now to be heard in almost every part of the United States.

It is hard to explain this change in feeling. Probably it is due to the distaste for pessimism which many men of affairs are coming to feel. Certainly there is a wider recognition of the fact that America cannot revert to primeval chaos, and each day increases the number of those who admit that they are weary of woe and would like to hear more of cheerfulness, at least for a little while.

In the stock market and on the commodity exchanges there has been some increase in business activity. Prices on the Stock Exchange seemed on Wednesday to have turned the corner, but Thursday brought a resumption of the decline to new lows. Those who are looking for the "bottom" cannot have much longer to wait.

In the commodity markets the staples that are produced in the United States have been steady, but imported necessities such as coffee, sugar, rubber, silk, etc., are slightly lower. Those who pretend to understand the matter say that the decline in some of these commodities is largely due to the gradual abandonment of the gold standard in the Far East. This seems to be logical, although it is a little difficult to explain within the limits of the space allotted to this article.

Distributive trade in the United States is said to be active, but the Christmas shoppers have not yet finished their purchases, and the real status of American business will not be discernible until shortly after New Year's Day.

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THE BUSINESS WEEK

December 23, 1931

Cursed with its customary calendar complex, business seems bent on taking one more belly-whopper to the bottom of the hill to see how far it can go before the midnight whistles blow Dec. 31 . . . The securities markets have settled themselves on the same toboggan; even Congress is engaged in a last snow-ball and mud-slinging frolic before scattering for the Christmas armistice; and all important issues here and abroad subside into a state of suspended animation until the enigmatic 1932 emerges . . . Almost all business indicators show intensification of the usual year-end slackness, and retail trade less than its customary seasonal stimulation . . . Tax-selling, annual window-dressing and distress liquidation have converted securities markets into rummage sales at which even a second-hand teddy-bear would be ashamed to be seen . . . Another outbreak of bank suspensions shows the need for speedy congressional action on the President's Reconstruction corporation proposal . . . Japan starts the New Year right by sliding off the gold standard, leaving a dwindling handful of the faithful to carry their golden cross until the inevitable conference is called to consider means of restoring monetary sanity . . . Many still see a silver lining in this spreading cloud of devaluation . . . The reassuring steadiness of some key commodity prices is an almost solitary star shining among the discouraging Christmas statistics as a slight sign to the wise men that the dark days of deflation may be about ended and the New Year bring with it a more stable basis of values upon which to rebuild business.

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Material Trends and Prices . . . .

An operating rate as low as 20 per cent of capacity is likely to prevail in the steel mills by the end of the year. Demand for automotive and construction steel has fallen short of anticipated volume in the last four weeks. Railway buying awaits the outcome of the present wage controversy. Concessions in strips and sheets appeared during the week but prices of other steel items remain unchanged.

(All prices as of Dec. 18, 1931)

IRON AND STEEL

Pig Iron —	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$11.00	$11@$12	$14.00
Buffalo, No. 2, Fdry., per gross ton	15.00	17.00	15.25
Heavy Melting Steel Scrap — Pittsburgh consuming point, No. 1, per gross ton	10.00	10.00	12.75
Furnace Coke — Connellsville, per net ton	2.35	2.40	2.40
Foundry Coke — Connellsville, per net ton	3.25	3.25	3.50
Steel Shapes — Pittsburgh, base, per 100 lb	1.50@1.60	1.60	1.60

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Iron Machinery Castings — Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb.:

Chicago....4.62½ Cleveland....4.50 New York....4.75
Cincinnati....4.35 Detroit....4.00

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Steel Sheets — Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Blue annealed, No. 10	1.85	3.20	3.00	3.40
Black sheets, No. 24	2.40	3.55	3.60	3.50
Galvanized, No. 24	2.90	4.10	4.00	4.00

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Seamless Steel Tubing — Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall		Outside Dia. in Inches						
		⅛	¼	⅜	½	1	1¼	1½
Inches	B.w.g.	Price per Foot						
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc. — Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.00	2.95
Bars, soft steel	3.10	2.75	2.75
Cold fin., flat or square	3.90	3.60	3.60
Cold fin., round or hexagon	3.40	3.10	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	3.65	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.95	3.00

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Stainless Steel — Hot-rolled bars, base, Pittsburgh. 0.12 per cent carbon, cents per lb.:

Chromium 15% and under....19.00 Chromium 18 to 23%....23.00
Chromium 15 to 18%....20.50 Chromium 23 to 30%....28.00

Bolts and Nuts—Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on bolts (except tire and stove) nuts, and lag screws, mill lots....73-10-10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:	
Aluminum ingots 99%, N. Y.	23.30
Copper, electrolytic, Conn.	6.50
Copper wire, base, Chicago and Cleveland	8.87½
Copper wire, base, N. Y.	8.75
Lead, pigs, E. St. Louis	3.55
Tin, Straits, pigs, spot, N. Y.	21.62½
Zinc, slabs, E. St. Louis	3.15
Prices following are in cents per lb., base, N Y., Chi. and Cleve.:	
Brass rods, high	10.62½
Brass sheets, high	12.87½
Brass tubing, high	16.12½
Copper, drawn round	13.37½
Copper sheets	15.87½
Copper tubing	15.37½
Prices following are in cents per lb., del. from N. Y. warehouse:	
Babbitt, anti-friction, general service	28.50
Babbitt, com'l, intermediate grade	34.25
Babbitt, genuine, highest grade	43.00
Solder, bar	16.87½
Prices following are in cents per lb., base, Huntington, W. Va.:	
Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals — Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	2.25	2.00	2.50
Light brass	1.75	1.25	2.00
No. 1 rod-brass turnings	2.75	2.25	2.25
Heavy copper	4.75	3.75	3.75
Light copper	3.75	3.25	3.50

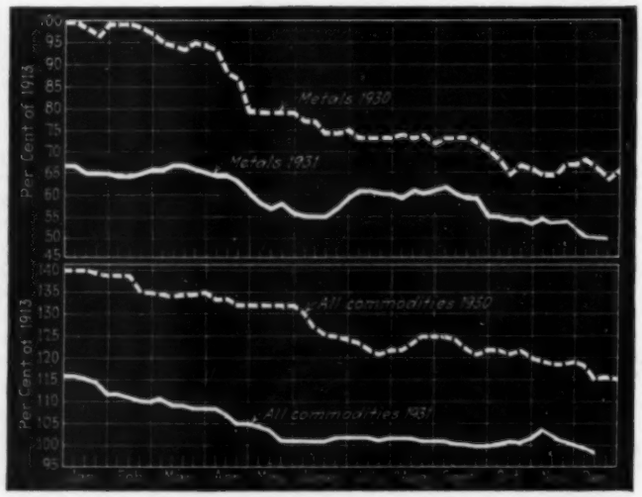
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide No. 50 grain, cloth, 6-in. dia., X weight, per 100	$4.37	$4.59	$4.59
Belting, leather, heavy	30–10%	40%	40%
Belting, rubber, trans., Grade 1	60–10–10%	60–10%	60%

Lumber — Per M ft., b.m., 12-16 ft. lengths, delivered, N. Y.:

Crating — Southern pine:
1x4-in.... $27.00 1x6-in.... $26.00

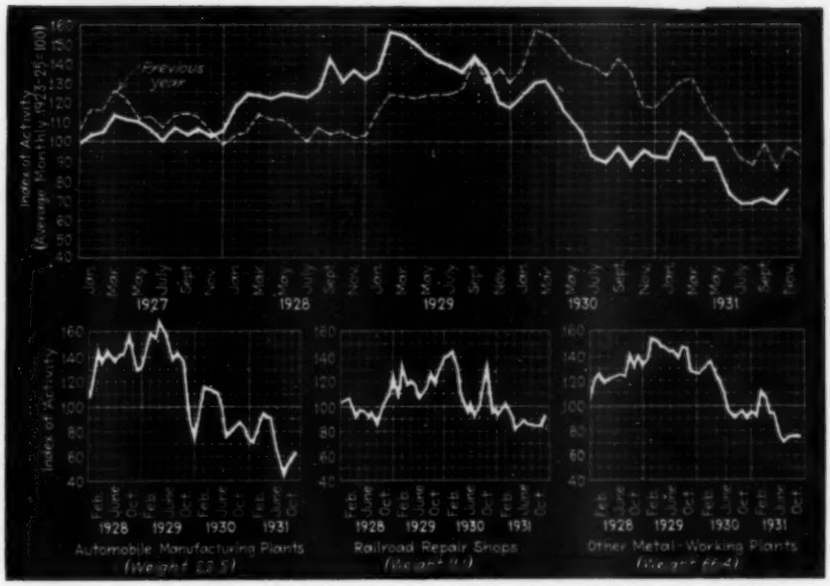
Skids—Spruce:
2x4-in...$37.00 3x4-in..$40.00 4x6-in..$42.00 6x6-in ..$50.00



Price Movements Week by Week

Average Price of Raw Metals: Pig Iron, Billet Steel, Copper, Tin, Lead, Zinc—American Machinist
Seventy-Four Commodities Index—The Annalist

NEWS



November Metal-Working Activity Shows Encouraging Upturn

An encouraging upturn in general metal-working activity is indicated by reports on consumption of electrical energy for power purposes. This contrasts with a more or less static condition for several months past. The final figure for November was 75.6, as compared with 69.4 for October, 71.2 for September, 68 for July and August, 78.2 in June, 89.1 in May, 92.4 in April, and 100.3 in March. These figures are all adjusted for 26 working days, as are subsequent ones.

The automobile shop index, 94.1 for March, 90.8 for April, 91.5 for May, 71.3 for June, 55.9 for July, 43.6 for August, 53.7 in September and 57.4 in October, rose eight points to 65.5 in November. The railroad repair shop index, 94.3 for March, 82.8 for April, 84.7 for May, 89.2 for June, 84.3 for July, 85.5 for August, 84.0 for September, and 84.5 for October, jumped ten points to 94.9 for November. Ferrous and non-ferrous metal-working plants outside these two groups had a March index of 100.5, an April of 94.6, May of 94.1, June 78.6, July 69.3, August 73.3, September 75.0, October 71.0, and a November increase of five points to 76.0.

When the figures are adjusted for seasonal variations, slight revisions occur. The railroad repair shop index drops to 90.1, and the automobile and general metal-working indexes rise to 78.1. This gives a total seasonally adjusted figure of 79.4. Railroad repair shop seasonally adjusted indexes were, in previous months, October 85.5, September 87, August 96.2, July 92, June 96, May 92.5, April 80.1, and March 90.3. Similar automobile indexes were, October 55.4, September 52, August 45.3, July 56.3, June 69.8, May 78, April 76, March 88.2. Similar figures for other metal-working plants are, October 72.5, September 76, August 79.3, July 73.5, June 82.8, May 91.7, April 92.4, March 95.3. The figures for the entire group were 70.1 in October, 79.1 in September, 73.5 in August, 71.7 in July, 81.4 in June, 87.3 in May, 87.9 in April, and 92.9 in March.

Bullard Company Elects Three Vice-Presidents

Bridgeport, Conn., Dec. 16—Announcement is made today by E. P. BULLARD, president of the Bullard Company, of changes made in the executive organization of the company at a director's meeting held yesterday afternoon by the election of D. B. BULLARD, mechanical engineer, J. W. BRAY, sales manager and L. S. HORNER, a new member of the organization, as a new group of vice-presidents respectively in charge of engineering, sales, and business promotion.

The changes are made in anticipation of a turn toward improvement in business conditions indicated from the current negotiations of the company and are preliminary to the announcement of an improved line of machine tool equipment which will be presented to the trade the first of the new year.

E. C. BULLARD retains the position to which he was appointed earlier in the year as vice-president and general manager. E. P. BLANCHARD is appointed sales manager.

L. S. HORNER, the new member of the official group, comes to the Bullard Company with a background of twenty-five years of manufacturing experience in New England. He was prominently connected with and responsible for the progressive campaign and the development of a sizeable volume in new products for the Acme Wire Co. at New Haven and was later president of the Niles-Bement-Pond Company in the reorganization and consolidation of their various allied operations, and later in the segregation of certain of their unrelated units for more economical operation. Mr. Horner is at present a director of the Niles-Bement-Pond Co., the Crocker-Wheeler Electrical Mfg. Co., the Acme Wire Co., the Burden Iron Co. and the Trucktor Corp.

H. S. Johnson Becomes President of Gisholt

HOBART S. JOHNSON, formerly vice-president of the Gisholt Machine Co., Madison, Wis., has been elected president to succeed his brother, the late CARL A. JOHNSON. FRED W. COOMBS, GEORGE JOHNSON and CHARLES H. JOHNSON were named vice-presidents. G. E. GERNON and M. I. JOHNSON were re-elected secretary and treasurer, respectively.

Hoover Donates $5,000 To Engineers' Relief

PRESIDENT HOOVER has donated $5,000 to the Professional Engineers' Committee on Unemployment "with no particular restrictions as to its use," H. DEB. PARSONS, general chairman of the Committee announced recently. The President's check was contained in a communication addressed to Mr. Parsons in which Mr. Hoover commended the work of the Committee and expressed interest in the small loans plan for relieving distress in individual cases. President Hoover's letter read as follows:

"THE WHITE HOUSE
WASHINGTON.

December 7, 1931.

Mr. H. deB. Parsons,
General Chairman,
Professional Engineers
Committee on Unemployment,
29 West 39th Street,
New York City.

My dear Mr. Parsons:

The devoted effort of your Committee in securing employment and relieving distress

among professional engineers has my sympathetic approval. I feel that the inherent administrative ability of American engineers to meet and cope with emergencies is sufficient assurance that any funds made available to you will be well administered and used to the best advantage, not only in finding useful employment, but by relieving individual cases of distress with small loans under liberal terms, which particularly appeals to me.

Having been informed that your Committee intends, if sufficient financial support is forthcoming, to extend its activities to a national scope, I am inclosing check for $5,000, with no particular restrictions as to its use, but as an encouragement of the splendid spirit which has inspired you and your associates in this undertaking.

Your faithfully,
HERBERT HOOVER."

The Professional Engineers' Committee on Unemployment was recently organized by the New York sections of the four National Engineering Societies to aid those of their members and other professional engineers who are in need.

Approximately 850 members of the profession, many of whom are destitute, have registered with the Committee which has headquarters in the Engineering Societies Building, 29 W. 39th St. It is estimated that 2,000 cases will be handled by the Committee before Spring.

More than $33,000 in cash has been raised by the Committee and pledges have been received for a considerable amount in addition. It is estimated that $200,000 will be required to carry out the relief program.

Engineering Economics Extension Course

In view of the present trend of the work of the engineer toward the economic and social aspects of engineering, as well as the permanent aspects, The University of Wisconsin Extension Division at Madison is offering a correspondence-study course in Engineering Economics, available for home study to students in any state. It is given by PROF. H. E. PULVER of the department of civil and structural engineering. It is intended as a first course on the subject, and will endeavor to provide engineers with a more comprehensive knowledge of this phase of economics through a presentation that is brief and practical and given from the engineering standpoint.

Trade Association Progress Indicated in Directory

The growth of organized cooperation in American business is evident in the latest compilation of "Commercial and Industrial Organizations" just released by the Department of Commerce. The present compilation contains the names of more than 19,000 organizations made up of over 2,600 national and interstate organizations, more than 3,000 state and territorial and 13,600 local. This represents an increase of about 45 per cent over the 1929 edition.

Thomas F. Jones Discusses Managerial Control of Labor and Materials

Speaking Dec. 15 before a joint meeting of the New York Chapter of the National Association of Cost Accountants with the New York group of the American Management Association, THOMAS R. JONES, vice-president and general manager, Harris-Seybold-Potter Co., discussed "Managerial Control of Labor and Materials."

In order to control, Mr. Jones stated, the general manager must (1) realize he doesn't control; (2) choose personnel wisely; (3) set adequate standards; (4) train and guide personnel to meet them; and (5) act as a coordinating agency between subordinates.

Assuming a set of conditions, Mr. Jones described the steps in setting up financial standards—whose basic mechanism is the budget. Since natural forces tend to keep expenditures above income, the engineering department must design a product that can be built, the shop must devise ways and means of making it, within the figures set. The influence the designer has on costs, the need for the engineer to get outside the drafting room and into the factory and foundry is illustrated in his company's experience with a machine which had five variations. Now one machine does all five jobs and costs only as much as the cheapest of the five variations. Standardization helps to control materials and labor by cutting factory paperwork to the minimum, by the elimination of extra blueprints, jigs, fixtures, gages. Standardization may well start in the engineering department.

Control of inventory is possible only when every man is trained to understand the meaning of large inventories which sew up working capital. Emphasis must be laid on the danger of building for stock. Depreciation and obsolescence are factors which demand constant consideration. Factory layout has much to do with keeping inventories at a low point.

In the control of labor, all effort that isn't direct and productive is waste, added Mr. Jones, and should be so recognized and segregated. Waiting time for materials, for tools, for foremen, set-up time, etc., however necessary they may be, are waste and must be so treated if they are to be kept at a minimum.

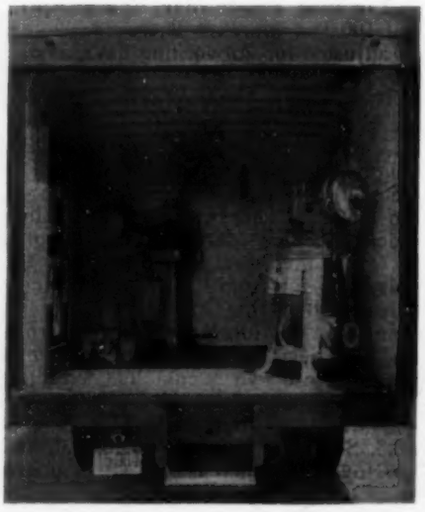
O. D. REICH, vice-president, Dexter Folder Co., discussed Mr. Jones's principles of control from the standpoint of factory application, drawing upon his own company's experience as a source of illustration. It is not difficult to set up standards on repetitive work and know they'll be met. With non-repetitive work the story is different. His company has compiled standard time data over a period of five years for every class of direct and indirect labor. With the aid of these data it becomes comparatively easy to set rates on any job.

The need to train foremen and to bring their responsibility home to them was emphasized in A. L. LUESSENHOP's description of the Western Electric Company's training program for supervisors. At his company the foreman becomes a conference leader and brings an appreciation of the management viewpoint to gangs and sections through their chiefs. In that way control is gained at the point where it can be controlled.

As chairman of the meeting, EARL WHITEHORNE, assistant vice-president, McGraw-Hill Publishing Co., Inc., spoke briefly of the problems with which management is confronted in the effective control of labor and material, and of the aims of these joint meetings to discuss managerial and industrial problems not strictly within the accounting field.

The consideration which management is giving to standardization as a means of controlling materials and labor is further emphasized by the fact that on the same evening the Society of Industrial Engineers, New Jersey Chapter, held a meeting in Newark on standards, and brought out many of the same points. J. C. METSCH, cost accountant, Lehn & Fink, discussed "Setting Standards and Controlling Factory Activities by the Use of Standards." A prize winner in the Jordan competition of the N.A.C.A., the speaker emphasized the value of variations from standard, especially in these times.

A. H. MOGENSEN, assistant editor, *Factory and Industrial Management*, described the procedure followed in setting standards by formula and chart. Time and motion study has progressed so that rates can be set in advance. Time saved in setting of rates is not the greatest advantage. More important is the accuracy and consistency of rates. Constant levels of incentive earnings in different departments are secured.



Campbell nibbling and cut-off machines are mounted in this traveling demonstration truck

Flanged Valve Dimensions Submitted for Comment

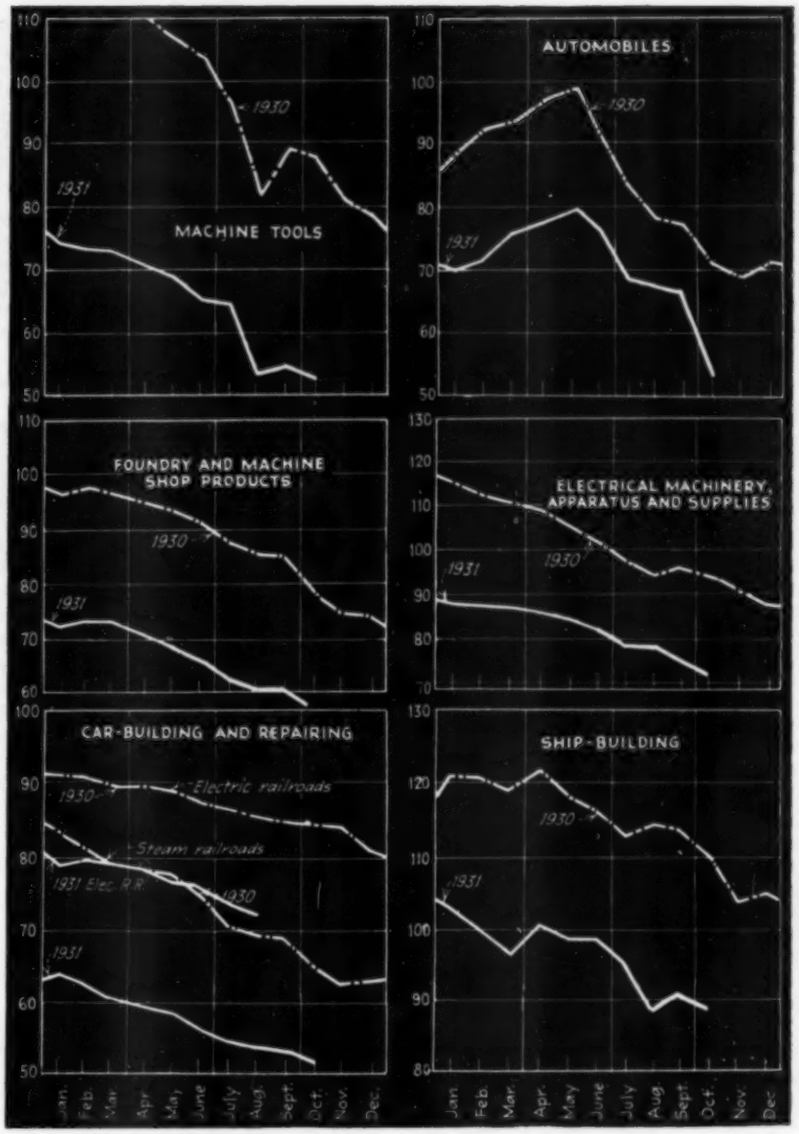
The center-to-face dimensions for ferrous flanged valves, recently developed and approved by the Manufacturers Standardization Society of the Valve and Fittings Industry as standard practice, have been tentatively recommended for adoption as an American Standard. The recommendation was made by Subcommittee No. 5 of the A.S.M.E. Sectional Committee on the Standardization of Pipe Flanges and Fittings. The proposal sets forth center-to-face dimensions of cast-iron and steel-flanged valves of the wedge gate, globe and angle types over several pressures and over a considerable range of sizes. The valves included are wedge gate valves from 125 to 1,500 lb. and 1 to 24 in. diam. globe valves from 250 lb. to 1,500 lb. and 1 to 8 in. diam., and angle valves from 250 to 1,500 lb. and 1 to 8 in. diam. This tentative proposal is now being distributed to a large number of interested firms and individuals for criticism and comment. After receipt of these comments the Subcommittee will formulate a definite recommendation for submittal to the Sectional Committee. Requests for more detailed information should be addressed to C. B. LEPAGE, assistant secretary, A.S.M.E., 29 W. 39th St., New York, N. Y.

Drill Jig Contest Winners Announced

The American Machinery & Tools Institute has announced the winners of the drill jig design contest held under the auspices of the institute and ending Nov. 30. The winner was WILHELM LARSEN, 945 Galt Ave., Chicago. L. OECKL, 4673 Scotten Ave., Detroit, and G. A. BARTEL, 460 22nd St., Oakland, Calif., were awarded certificates of merit. Designs were submitted from every part of the country and the drawings showed originality and independence in thought in solving the problem. These drawings have been referred to the standardization committee of the institute for further study.

Materials Handlers Name Governing Board

At the recent meeting of representatives of 62 material handling firms in Cleveland (*AM*, last week) at which the Materials Handling Institute was formed, a board of eleven governors representing groups within the industry was appointed. These men include H. W. STANDART, hoist and crane group; F. E. MOORE, gravity conveyors; J. B. WEBB, continuous conveyors; J. F. THOMAS, Nutting Truck Co., Faribault, Minn., floor trucks and casters; BRINTON WELSER, Chain Belt Co., Milwaukee, portable and bulk conveyors; E. F. TWYMAN, Barrett Cravens Co., Chicago, lifting trucks and portable elevators; S. W. GIBB, Yale & Towne Mfg. Co., Philadelphia, industrial trucks and tractors; WILLIAM E. BEE, Palmer-Bee Co., Detroit, transmission; H. H. PERRY, Geo. D. Whitcomb Co., Rochelle, Ill.; crawler cranes and locomotives; A. F. ANJESKEY, Cleveland Tramrail division, Cleveland Crane & Engineering Co., Wickliffe, O., tramrails; and RICHARD STRAW, American Kron Scale Co., New York, accessories.



TREND OF EMPLOYMENT IN METAL-WORKING INDUSTRIES Monthly average for 1926 = 100. Data supplied by the Bureau of Labor Statistics

Semi-Annual Meeting Scheduled by A.S.M.E.

Plans are well along for the Semi-Annual Meeting of the A.S.M.E., to be held at Bigwin Inn, Lake of Bays, Ont., Canada, from June 27 to July 1, 1932. The technical program is expected to include papers illustrative of engineering practice in Great Britain, Canada, and the United States. Among the subjects announced for discussion are model testing, hydraulics, machine-shop practice, organization and operation of industry, high-speed Diesel engines, turbine-room practice, electric boilers, steam-power-plant economics, and mixed-pressure locomotives. A general session is planned on "Standards of Qualification for Engineers."

Purchase Forms

The standing committee in charge of Simplified Practice Recommendation R37-28 on invoice, purchase order, and inquiry forms, met on Nov. 10, 1931, and unanimously decided to reaffirm the recommendation without change.

BUSINESS ITEMS

The Pyrometer Division of the Wilson-Maeulen Co., Inc., has been merged with The Foxboro Co., Foxboro, Mass. The action has followed twenty-five years of close cooperation between the two companies, and has been made in the interest of offering complete instrumentation to industry. The entire personnel of the Pyrometer Division will be merged with the Foxboro Co., and all products will be built in the Foxboro factory. The Rockwell Hardness Tester, previously manufactured by the Wilson-Maeulen Co., will hereafter be built and sold by the Wilson Mechanical Instrument Co., which succeeds the Mechanical Instrument Division of Wilson-Maeulen, and continues in the same factory and offices at 383 Concord Ave., New York City.

The Seattle factory of the Boeing Airplane Co., has now more than 1,000 employees on its payroll, setting a new employment peak for the past 29 months. The factory is working at capacity on military contracts, and work is under way on a new factory building to provide 12,500 sq.ft. of additional floor space in order to speed assembly of the new twin-engined bombers, of which the Army has ordered seven.

The Gabriel Co., Cleveland, Ohio, manufacturer of automobile snubbers, has purchased the plant of the Kari-Keen Mfg. and Irving Engineering Co., Sioux City, Iowa, on its bid of $110,000, at a receiver's sale. JOHN J. BATTERMAN, vice-president and treasurer of Gabriel, stated that his company hopes to begin production at the new plant by the first of the year.

The Wellman Engineering Co., Cleveland, Ohio, has acquired the clamshell bucket and heavy-duty trailer business of the G. H. Williams Co., Erie, Pa., including their goodwill, drawings, patterns, inventions and patents, and the engineering, manufacture and sale of these buckets and trailers will be immediately transferred to the Wellman plant in Cleveland.

The Machine & Welder Corp., 2604 North Cicero Ave., Chicago, Ill., has been organized to serve as General Electric Co. distributor of arc-welding equipment and accessories in the Chicago territory. F. P. KOHLBRY, formerly of Halpin-Kohlbry Inc., St. Louis, Mo., distributor of welding equipment, heads the company. H. C. KELSEY, formerly in charge of Buffalo district machinery sales for J. T. Ryerson & Sons Inc., R. B. ROGERS, formerly instructor in arc welding in the G.E. school, and J. C. KEENE are associated.

The Insley Mfg. Co., Indianapolis, Ind., steel fabricator, has withdrawn from the National Equipment Corp., according to WILLIAM H. INSLEY, president. The National Equipment Corp. is a $9,000,000 holding company formed by PHILLIP A. KOEHRING, deceased. Five other concerns holding leadership in the manufacture of contractors' equipment were associated in the merger.

The Puget Sound Navy Yard has purchased three 14-in. lathes from the Monarch Machine Tool Co., Sydney, Ohio. The same factory has also sold a 24-in. lathe to the Oregon State Highway Department, through the Halladie Machinery Co., Seattle, Northwest representative.

The Whittlesey Mfg. Co., Bridgeport, Conn., has been sold at public auction by order of the receivers to Isaac Diengott. The plant is a four-story structure with 75,000 sq.ft. of floor space. Mr. Diengott is president of the Hub Chair Co., the Bridgeport Chair Co., and the Beacon Table Co., all of Bridgeport.

The Allen-Bradley Co., 1311 S. First St., Milwaukee, Wis., has appointed the Petroleum Electric Co., 522 Commercial Bldg., Tulsa, Okla., as Oklahoma agent for controllers for a.c. and d.c. motors used in the petroleum and other industries. The Petroleum Electric Co. also has a branch office at 531 W. Main St., Oklahoma City.

The Shaw-Palmer-Bakewell Co., 409 East Third St., Los Angeles, Calif., has been appointed exclusive sales representative in the Los Angeles district for the Hypressure Jenny, the spray cleaning machine manufactured by the Homestead Valve Mfg. Co., Inc., Coraopolis, Pa.

The Hydraulic Lathe Co., Seattle, Wash., with capital of $50,000, has been organized by L. F. COLLINS, W. A. BOSTICK, WESLEY LANGER, R. L. ADAIR and J. E. BRADFORD, 1108 Smith Tower, to handle hydraulic screw-cutting precision control devices for lathes of every kind.

The Winchester Repeating Arms Co. plant, at New Haven, Conn., has been sold at a foreclosure auction, and it is assumed that the property will be turned over to the Western Cartridge Co., which recently made the only satisfactory offer for the plant.

The Keene (N. H.) Foundry, Inc., has awarded a contract to Glenroy Scott, for a sandblast room and finishing department, one story, 35x55 ft., to include monorail conveyor. RICHARD AVERILL is president.

Schick Dry Shaver, Inc., Stamford, Conn., has been formed to manufacture an electrical shaving device. Preliminary orders obtained were sufficient to cause the company to work overtime.

The United Electric Controls Co., 69 A St., South Boston, has begun manufacture of Ziegler-type signal relays for use in connection with automatic signal systems. The company also makes oil burner control devices.

The Commonwealth Edison Co. has ordered $375,000 worth in switching equipment from the Westinghouse Electric & Mfg. Co. for use in the latter's new Humboldt Park Station.

The Clyde Equipment Co., Seattle, Wash., is remodeling its offices.

The Chambers Electric Brake Co., 1308 Northern Life Tower, Seattle, Wash., has been incorporated by M. BURR CHAMBERS and associates, with capital of $50,000, to patent, manufacture and deal in electric and other appliances for motor vehicles.

The Polytechnic Institute of Brooklyn is holding its annual Open House on Friday, Jan. 15, between 4:30 and 10:00 o'clock.

Assets, machinery and plant of the Peerless Machinery Co., Cedar Falls, Iowa, have been sold to GEORGE E. HEARST by the receiver on court order.

The Barsam Metal Works Co., 2150 Washington St., Roxbury, is a new firm making sheet metal products.

The Samuel Winslow Skate Mfg. Co., Worcester, Mass., was sold at public auction Dec. 1. B. L. HANDELMAR bid in $14,500 for the entire property, and real estate and factory buildings were later sold to BEN COTTON for $8,000 to be converted into a storage warehouse. Patent rights for the Winslow skate were purchased by the Matthew Mfg. Co. for $2,650, and this company will continue to manufacture ice skates but will abandon roller skate manufacturing.

The Dominion Bridge Co., Ltd., has started erection of another addition to its plant at Vancouver, B. C., according to an announcement by A. S. GENTLES, general manager. The new portion will be equipped for the processing of large diameter steel pipe and will step up the capacity of the plant to 600,000 tons monthly.

PERSONALS

JOHN E. BARKLE has been appointed general manager of the South Philadelphia Works, Essington, Pa., of the Westinghouse Electric & Mfg. Co. Mr. Barkle joined Westinghouse in 1901, has been successfully filling positions of increasing responsibility in the works department. In 1916 he was made superintendent of a factory in Pittsburgh for the manufacture of munitions. In 1919, Mr. Barkle was placed in charge of the erection of the first electric passenger locomotive delivered to the Chicago, Milwaukee & St. Paul Railroad. Later he was placed in charge of all district office service shops as general superintendent, and in 1926 was made

superintendent of manufacturing of all generating apparatus at East Pittsburgh. In December, 1929, he was appointed works manager at the South Philadelphia Works.

JOHN ANDERSON, assistant to J. G. BARRY, vice-president, has been appointed secretary of the sales committee of the General Electric Co., Schenectady, N. Y. Mr. Anderson succeeds E. G. WATERS, who is retiring at his own request on the completion of more than 42 years' continuous service, the past 25 as secretary of the sales committee.

H. P. CHARLESWORTH, vice-president of the Bell Telephone Laboratories, has been nominated for president of the American Institute of Electrical Engineers. J. ALLEN JOHNSON, chief electrical engineer of the Buffalo, Niagara & Eastern Power Corp., has been nominated for Northeastern district vice-president; E. B. MEYER, vice-president of United Engineers & Constructors, Inc., for New York City district vice-president; K. A. AUTY, sales engineer of the Commonwealth Edison Co., for Great Lakes District vice-president; G. A. MILLS, chief engineer of Central & South West Utilities Co., for the Southwest district, and C. R. HIGSON, Supt. of Distribution for the Utah Power & Light Co., for the Northwest district. These candidates will be voted upon at the coming election in the Spring of 1932.

D. W. DEAN has been appointed manager of the Control Section of the Industrial Department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., to succeed the late W. H. MacGillivary. Mr. Dean has been connected with Westinghouse since 1921 and prior to that time was in the Electrical Department of the Buckeye Steel Castings Co., Columbus, Ohio. He has been a member of the Steel Mill Section of the General Engineering Dept. since 1922 and is recognized as an authority on the design and application of steel mill equipment.

A. N. GEYER, for several years maintenance engineer with the Utah Power & Light Co., Salt Lake City, has resigned to join the Woodward Governor Co., Seattle, Wash.

J. BARTON HOAG, assistant professor of physics, University of Chicago, has been elected chairman of the Chicago section, Institute of Radio Engineers. ROBERT M. ARNOLD, chief engineer of the radio division, Grigsby-Grunow Co., has been elected vice-chairman, and DONALD H. MILLER, western manager of *Electronics* and *Radio Retailing*, McGraw-Hill publications, has been elected secretary-treasurer.

HARRY J. HOSKING has resigned his position in the research laboratory of the Roessler & Hasslacher Chemical Co., Niagara Falls, N. Y., to take up similar work with Foster D. Snell, Inc., 130 Clinton St., Brooklyn, N. Y. W. C. PINKERTON has taken a position as industrial representative with Foster D. Snell, Inc. He was previously with the International Exposition Co.

BANCROFT GHERARDI, vice-president of the American Telephone & Telegraph Co., has been re-elected president of the American Standards Association for 1932 at the Annual Meeting of the Association. Other officers, also re-elected, are: CLOYD M. CHAPMAN, consulting engineer, United Engineers & Constructors, Inc., who is vice-president of the American Standards Association and chairman of the ASA Standards Council, and JOHN C. PARKER, of the Brooklyn Edison Co., vice-chairman of the Standards Council.

A. S. GENTLES and A. G. LANGLEY have been elected president and vice-president respectively of the Association of Professional Engineers of British Columbia. Election took place at the annual meeting recently. Mr. Gentles is a graduate of McGill University and is at present manager of the Dominion Bridge Co. plant at Vancouver. Mr. Langley is also a graduate of McGill and has engaged in mining engineering in Arizona and in Mexico and operated a practice in Vancouver since 1908.

FRANK H. LAMB has organized the Lamb Tractor Co. at Hoquiam, Wash. and incorporated it for $400,000 for the manufacture of SpeedTrak tractors. It will be a separate unit of the Lamb-Grays Harbor Co., of Hoquiam, in which Mr. Lamb is a partner.

C. F. RADLEY, publicity director of Oakite Products, Inc., New York City, has been elected president of the Exhibitors' Committee Industrial and Power Shows, Inc., 403 Graybar Bldg., New York City. VICTOR WICHUM, of the C. J. Tagliabue Mfg. Co., has been elected vice-president, G. S. CARRICK, of the American Arch Co., has been elected secretary, while J. P. FERGUSON, of the Reading Steel Casting Co., will act as treasurer.

H. F. WEATHERBY has retired from Buckner-Weatherby, Inc., dealers in machinery, 1743 First Ave. South, Seattle, Wash., on account of ill health.

OBITUARIES

FREDERICK S. JORDAN, 62, leader in the nickel industry and sales manager of the International Nickel Co., New York City, died suddenly Dec. 16 of a cerebral hemorrhage.

FRANK H. MARTIN, 50, engineer associated with some of the largest hydro-electric and industrial projects in North and South America, died in Winnepeg, Man., Dec. 17.

LEROY H. MINTON, 49, authority on ceramics and a consulting engineer with offices at 31 Nassau St., New York, died suddenly of a cerebral hemorrhage, Dec. 15. He was a director of the Seal Joint Co., and the American Shaw Gas Kiln Co.

ROBERT PATTERSON, 62, a former director of the National Cash Register Co., Cincinnati, died Dec. 16, at Dayton, following an operation. He was superintendent of National Cash Register in 1918 and for many years was a member of its board of directors and a heavy stockholder.

W. H. PRESCOTT, director of the Osborn Mfg. Co., Cleveland, and the Reliance Electric Co., Cleveland, and formerly a director of the Central Alloy Steel Co., before it was merged with the Republic Steel Corp., died Dec. 14.

ENOCH TROBECK, 58, vice-president of the National Acme Co., Cleveland, died suddenly in Leipzig, Dec. 15. He was a native of Sweden but made his home in Berlin. He had been connected with the National Acme Co. for forty years and had been that company's foreign representative for 31 years.

MEETINGS

NATIONAL AUTOMOBILE SHOW
New York, Grand Central Palace, Jan. 9-16; Chicago, Coliseum, Jan. 30-Feb. 6.

STEEL FOUNDER'S SOCIETY OF AMERICA, INC.
Annual meeting, Chicago, Ill.. Jan. 21, 1932. G. P. Rogers, managing director, 932 Graybar Bldg., New York City.

NATIONAL ASSOCIATION OF ENGINE & BOAT MANUFACTURERS
Motorboat and marine engine show, Grand Central Palace, New York City, Jan. 22-30, 1932. Henry R. Sutphen, president.

SOCIETY OF AUTOMOTIVE ENGINEERS
Annual meeting, Book-Cadillac Hotel, Detroit, Mich., Jan. 25-29. John A. C. Warner, secretary, 29 West 39th St., New York, N. Y.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
Annual Winter meeting, Engineering Societies Bldg., New York, N. Y., Jan. 25-29. F. L. Hutchinson, secretary, 33 West 39th St., New York City.

SECOND INTERNATIONAL HEATING & VENTILATING EXPOSITION
Sponsored by American Society of Heating & Ventilating Engineers, in conjunction with A.S.R.E., American Oil Burner Ass'n, and National Warm Air Heating Ass'n. Cleveland Auditorium, Cleveland, Ohio, Jan. 25-29.

AMERICAN MANAGEMENT ASSOCIATION
Packaging, packing and shipping exposition Palmer House, Chicago, Ill., Mar. 7-12, 1932. W. J. Donald, managing director, Room 602, 225 West 64th St., New York, N. Y.

FOUNDRY AND INDUSTRIAL EXPOSITION
Also 36th annual convention, American Foundrymen's Ass'n. New Municipal Auditorium, May 2-6. C. E. Hoyt, manager, American Foundrymen's Ass'n., Inc., 222 W. Adams St., Chicago.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Calif., Bieber—Great Northern Railway Co., St. Paul, Minn., awarded contract for construction of roundhouse and shops here. Estimated cost to exceed $40,000. J. R. W. Davis, St. Paul, Ch. Engr.

Calif., Long Beach—City is having revised plans prepared for a 3 story, 60 x 120 ft. public utility building including garage at Broadway and Pacific Ave. Estimated cost $100,000. Dedrick & Bobbe, 901 Heartwell Bldg., Archts.

Calif., Mare Island (Sta. Vallejo)—Bureau of Yards & Docks, Navy Dept., Washington, D. C., will receive bids until January 6 for construction of a battery overhaul shop here. Estimated cost $240,000. Noted December 3.

Calif., Santa Ana—Martha Medlock, 820 North Main St., having plans prepared for 1 story, 115 x 121 ft. garage and sales rooms at 806 North Main St. Frank Lansdowne, 514½ North Main St., and George D. Riddle, 201 Pacific S. W. Bldg., Long Beach, Archts.

Calif., Stockton—Pacific Gas & Electric Co., 245 Market St., San Francisco, awarded contract for construction of a 1 story meter shop here. Estimated cost $45,000. Noted December 3.

Conn., Greenwich—School Board, plans addition to Byram high school including manual training department. Estimated cost $325,000. Coffin & Coffin, 522 5th Ave., New York, N. Y., Archts.

Ill., Lockport—Catholic Boy's Trade School, awarded contract for airplane hangar to include repair shop at Vocational Training School. $35,000. Joseph W. McCarthy, 221 North La Salle St., Chicago, Archt.

Ind., Evansville—Mead-Johnson Co., 200 South St. Joseph Ave., awarded contract for construction of a factory at Ohio and St. Joseph Sts. Estimated cost $40,000.

Ia., Des Moines—City Council, preparing plans for municipal airport at 21st St. and Army Post Road to include hangar, repair shop, etc.

Ia., Dubuque—Maizewood Products Corp., plans reconstruction of plant for the manufacture of wallboard and kindred products, destroyed by fire. Loss $100,000.

Mass., Cambridge (Boston P. O.)—School Commission, will receive bids until January 5 for construction of a 5 story technical high school on Broadway. Estimated cost $1,500,000. R. H. Doane, 60 Batterymarch St., Boston, Archt.

Mass., Waltham (Boston P. O.)—Woodward & Tyler, 844 Main St., receiving bids for construction of 1 story service station at Main and Bank Sts. Estimated cost $50,000. Private plans. Noted December 17.

Mich., Negaunee—John Snell, plans construction of a 1 story, 50 x 60 ft. repair and service garage on Gold St.

Minn., Minneapolis—Woolsey Mfg. Co., 2920 Talmadge Ave. S. E., (machinists) awarded contract for a 1 story, 35 x 80 ft. addition to factory.

Mich., Northville—Wayne County Training School, preparing plans and will soon receive bids for 2 story addition to vocational training school. No. 0 Gould, Empire Bldg., Detroit, Archt. and Engr.

Mo., St. Louis—Motor Electric Service Co., 3912 Washington Ave., plans construction of a 1 story factory.

N. J., Camden—Camden Wire Co., 108 Chambers St., New York, N. Y., plans rebuilding and repairing plant destroyed by fire. $40,000.

N. J., Carlstadt—Plastic Art Marble Co., 321 11th St., will soon award contract for a 2 story factory on 14th St. Estimated cost $40,000. J. Thomas Camlet, 26 Piaget Ave., Clifton, Archt.

N. J., East Orange—Owner c/o K. W. Dalzell, 263 Central Ave., Archt., having preliminary plans prepared for a 2 story garage building and show rooms. Estimated cost $150,000.

N. J., Jersey City—Harry Adelman, 437 Broadway, Bayonne, Archt., will receive bids until January 22 for construction of a 1 story garage and bus terminal at Gate Ave. and Merritt St. here, for Lafayette-Greenville Bus Owners Association and Greenville Bus Co., 77 Seaview Ave., Jersey City. Estimated cost $150,000. Noted December 17.

N. J., Jersey City—Jersey City Welding & Machine Works, 394 Grand St., plans construction of a 2 story factory. Estimated cost $40,000.

N. J., Jersey City—Owner c/o Barney D. Singer, 921 Bergen Ave., Archt., having preliminary plans prepared for a 1 story addition to machine shop on Hill St. Estimated cost $40,000.

N. Y., Batavia—Doehler Die Casting Co., plans extensions to plant including machinery and auxiliary equipment.

N. Y., Buffalo—Westinghouse Electric & Mfg. Co., Ellicott Sq. Bldg., awarded contract for a land 2 story manufacturing plant and warehouse.

N. Y., Glendale—Asco Supply Co., plans construction of a 100 x 165 ft. pipe shop and storage building. Estimated cost $40,000.

N. Y., Jamaica—J. A. C. Realty Corp., 16 Court St., Brooklyn, having sketches made for construction of a service garage here. Estimated cost $40,000. C. Goodman, 375 Fulton St., Brooklyn, Archt.

N. D., Niagara—E. B. Spillum, plans reconstruction of 1 story, 50 x 60 ft. repair and service garage destroyed by fire.

N. D., Park River—J. C. Overby and Roy Scilmore, are considering reconstruction of 1 story repair and service garage destroyed by fire. Loss $25,000.

Pa., Pittsburgh—Frick-Reid Supply Co., 111 Sandusky St., manufacturers of oil well equipment, having plans prepared for a 1 story addition to shop and storage building. Estimated cost exceed $40,000.

Wis., Beloit—Beloit Iron Works, awarded contract for a 2 story, 60 x 150 ft. addition to pattern shop. Estimated cost $40,000.

Wis., Marshfield—Felker Bros. Mfg. Co., manufacturers of sheet and plate products, has work under way on a 1 story, 60 x 100 ft. addition to shop.

Wis., Prentice—Wisconsin Telephone Co., 722 North Broadway, Milwaukee, awarded contract for construction of a repeater station here. Estimated cost $40,000.

Ont., Sarnia—Perkins Bakery Co., Saginaw, Mich., manufacturers of bakery and confectionery machinery, plans construction of a plant here. Equipment will be required.

Ont., Toronto—Dominion Enamelware Co. Ltd., is considering erection of plant here.

Ont., Toronto—Planet Mfg. Co. Ltd., C. Havelock Taylor, Pres., manufacturers of cyclinder grinders, plans construction of a plant. Estimated cost $50,000.

Equipment Wanted

Ia., Des Moines—Capitol Machine & Tool Co., 208 East Locust St.—d.c. electric welder.

Ia., Des Moines—Haight Tractor & Equipment Co., 1314 Walnut St.—bench grinder, large drill press, small lathe, independent motors, welding outfit and large vise and anvil, 30 ton press.

Wash., Tacoma—Cecil Cavanaugh Lumber Co., 1423 Puyallup Ave.—traveling crane for mill and cabinet shop recently destroyed by fire. $40,000.

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Printed in U. S. A.

7005
473
7478

7005 units of new equipment, tools, materials and parts for metal product manufacture have been pictured and described in American Machinist Semi-Annual Equipment Review Numbers since the editors originated this service for you in July of 1923.

473 more will appear in the next Review Number of January 21, completing with this eighteenth number a total of nine years of comprehensive, useful review of practically every essential need in metal product manufacture.

7478 is a big total. It reflects enterprise on the equipment builders' part. It offers you opportunity to get your work through at ever-diminishing cost. These newest 473 units merit your study, warrant their being kept before you, justify modernization in your plant.

THE JOHNSON FRICTION CLUTCH

FOR THE PAST 30 YEARS
The JOHNSON CLUTCH

HAS BEEN USED IN ALL INDUSTRIES ON
ALL TYPES OF MACHINERY, SUCH AS—

FOOD	RUBBER
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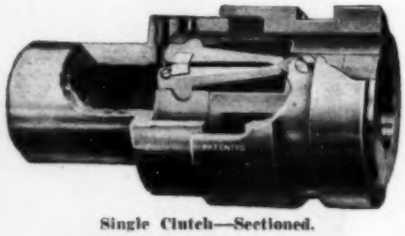
Single Clutch with Pulley

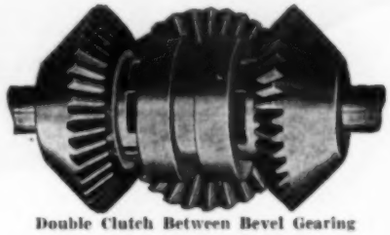
We are developing a smaller size of clutch which can be produced at a low cost on a quantity basis. Investigate this clutch for use on Talking Machines, Sewing Machines, Washing Machines, Airplanes, etc.

Double Clutch with Pulleys

If the clutch you require must stand up under hard use such as high speeds, heavy starting loads, excessive slipping and continuous engaging, use the New SUPER-JOHNSON Clutch. It is designed purposely for such clutch power transmission drives.



Single Clutch—Sectioned.

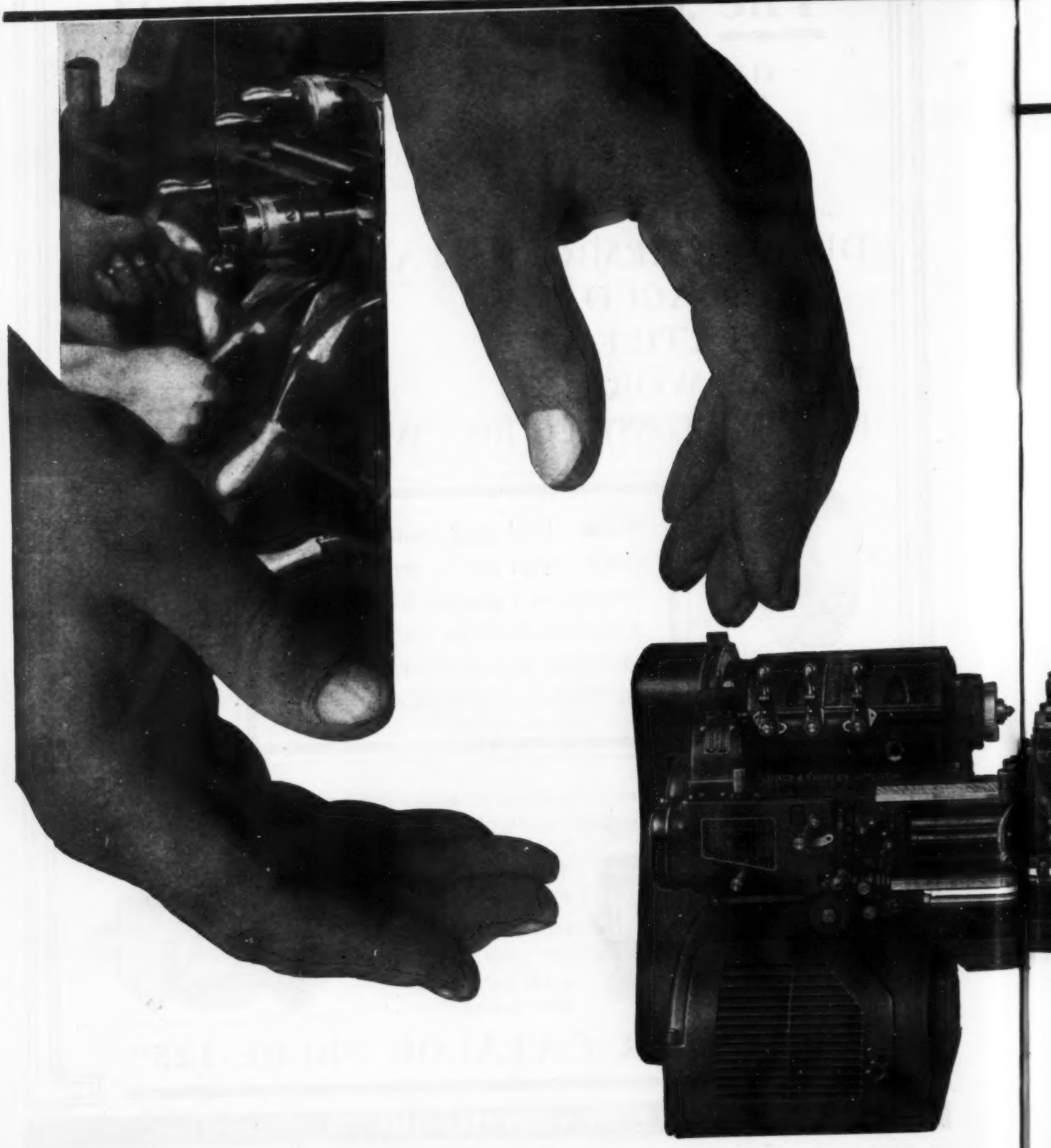


Double Clutch Between Bevel Gearing

SEND FOR CATALOG "BLUE-125"

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN

YOUR HANDS *will*



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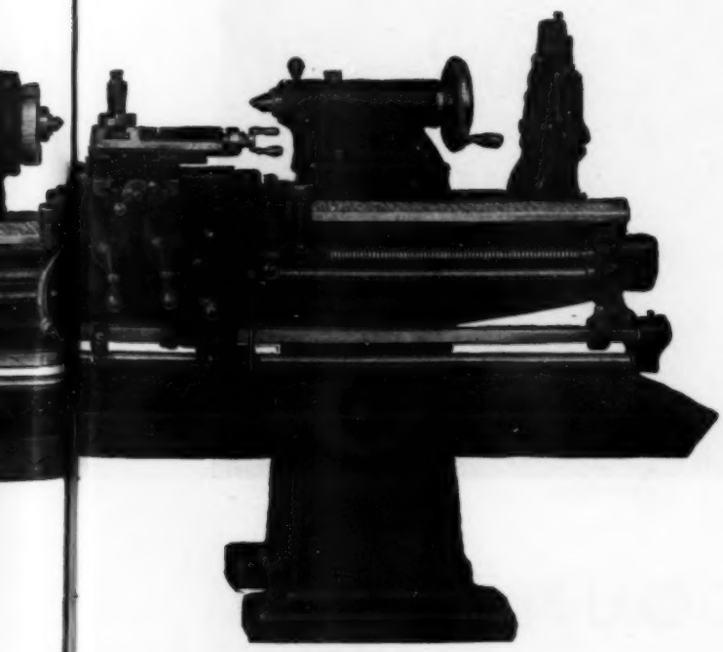
it's a Lodge & Shipley

THE "feel" of a Lodge & Shipley is more than the mere convenience of exerting very little physical effort. It is an identifying characteristic of the Lodge & Shipley Lathes.

When a clutch is thrown in, or a handwheel revolved, the smooth, positive response assures the operator that the machine is capable of accurate performance that is out of the ordinary. The operator, knowing he can depend on his Lodge & Shipley to hold to close tolerances, is given an incentive to produce work exactly to blueprint specifications.

In addition to holding close tolerances, this smoothness of operation is a factor that is directly reflected on the cost sheet. On the Lodge & Shipley Lathes the conveniently placed controls handle easily—and can be operated with *no lost motion* on the part of the operator. Multiply the time thus saved by the multitude of times the controls are manipulated, and the economy effected is a worthwhile consideration.



THE LODGE & SHIPLEY MACHINE TOOL COMPANY

CINCINNATI, OHIO

If you are not already familiar with Lodge & Shipley Line, we will be glad to direct you to enthusiastic owners in your locality.

LATHES! GOOD LATHES ONLY

In

New No. 2 Cincinnati Cutter Grinder equipped with face mill grinding attachment. Face mills up to and including 18 in. in diameter are quickly and accurately ground. Blanchard Machine Company reduced their sharpening time 75% on 14 in. diameter face mills (in one-fourth the time).

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DEPENDABLE COUNSEL ON

1/4 of the TIME

A sound replacement policy enabled the Blanchard Machine Company to sharpen 14″ diameter face milling cutters in one-fourth the former time. Other tools are ground with corresponding decrease in overall time on the Cincinnati No. 2 Cutter Grinder.

Performance records like this, and an intensive analysis at our factory, lead us to say that you may expect to grind a large variety of cutters and reamers . . . an average of 25% faster than on the former No. 1½ and similar machines. This gives an unusually attractive return of 56% on investment.

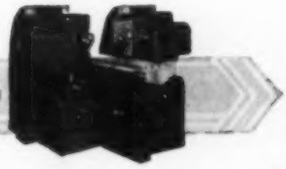
The Cincinnati No. 2 Cutter Grinder and Cincinnati Millers have been made so highly productive, extraordinarily accurate, easy to operate and control, that they effect reductions in costs only known to those who use them.

Are you looking into the question of replacement? Give Cincinnati Millers and Cincinnati Grinders an opportunity to lower your costs!

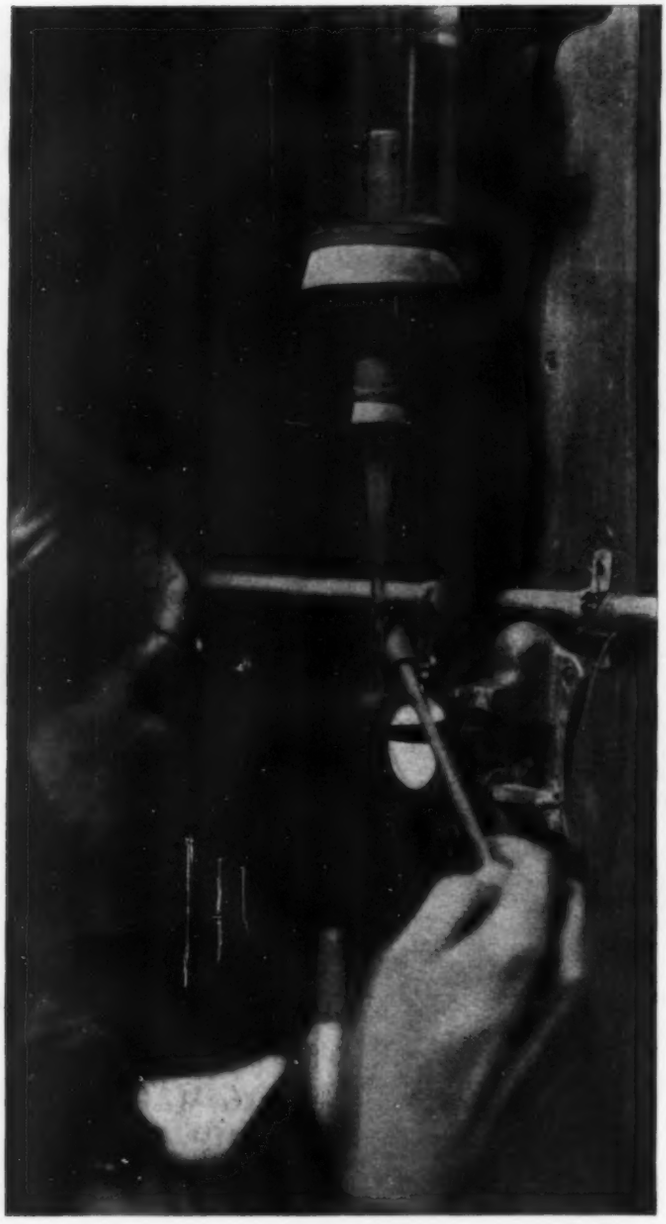
CINCINNATI

THE CINCINNATI MILLING MACHINE COMPANY
Cincinnati, Ohio, U. S. A.

MILLING AND GRINDING



Controlled Abrasive Flours



For Finer Finishes

ALUNDUM and Crystolon Abrasive Flours are controlled in size, shape, structure and every other quality or characteristic.

They are extremely low in iron content and are especially suitable for use where finished surfaces must be clean.

This Sedimentation Apparatus correlates time and space to check the accuracy of size of abrasive flours. It is one of the scientific instruments in constant use at the Norton plant.

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POLISHING ABRASIVES

Wg-391

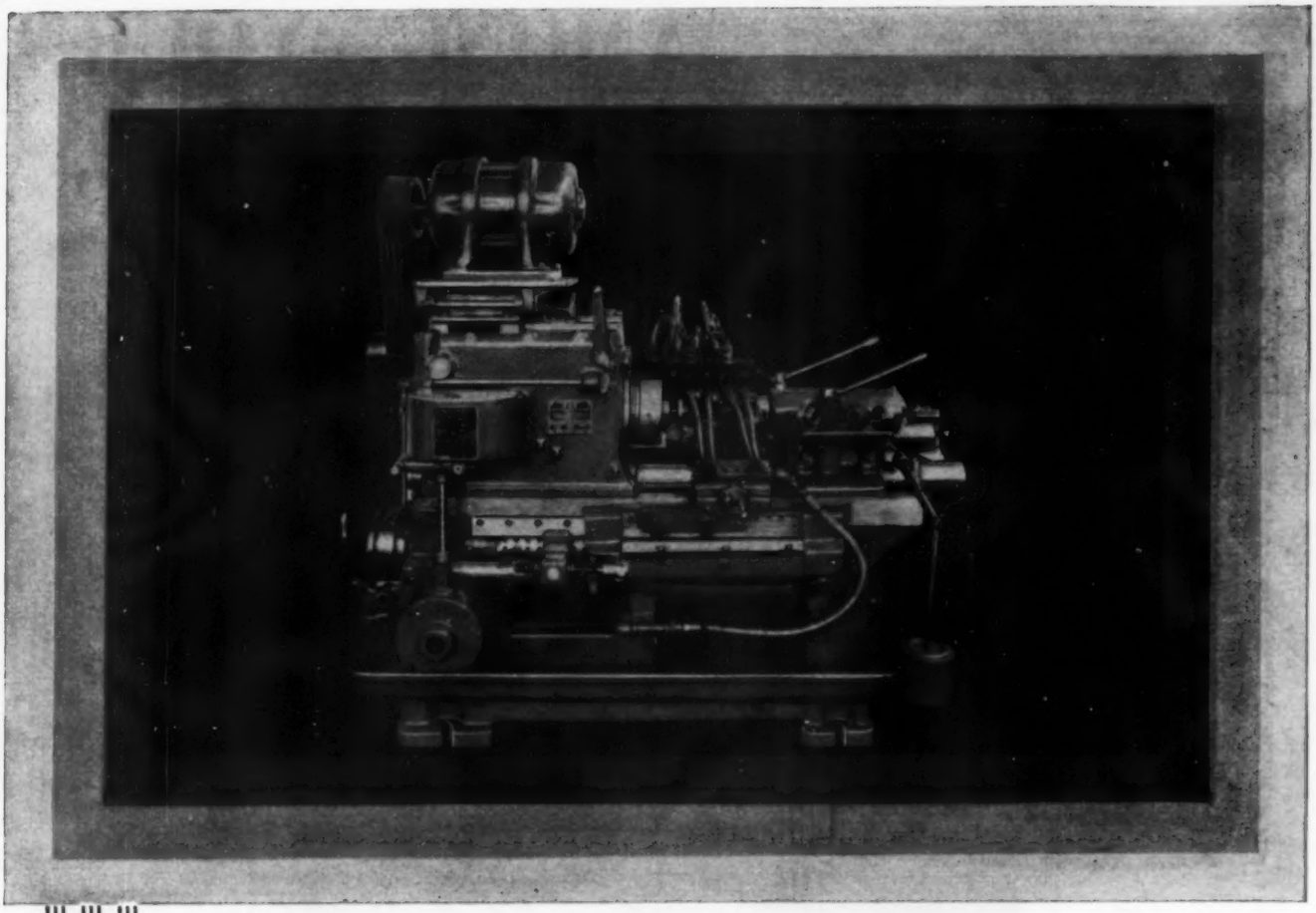
. . . . . AMONG YOUR NEW YEAR RESOLUTIONS,

We suggest this one:

RESOLVED—***That we will investigate the savings that can be made in our drilling costs by the use of SUPER-SERVICE Radials and Cincinnati Upright Drills.***

THE CINCINNATI BICKFORD TOOL COMPANY

OAKLEY, CINCINNATI, OHIO



Greater

Speed

and

New Tooling
possibilities
characterize
The LITTLE

12″ FAY

J&L
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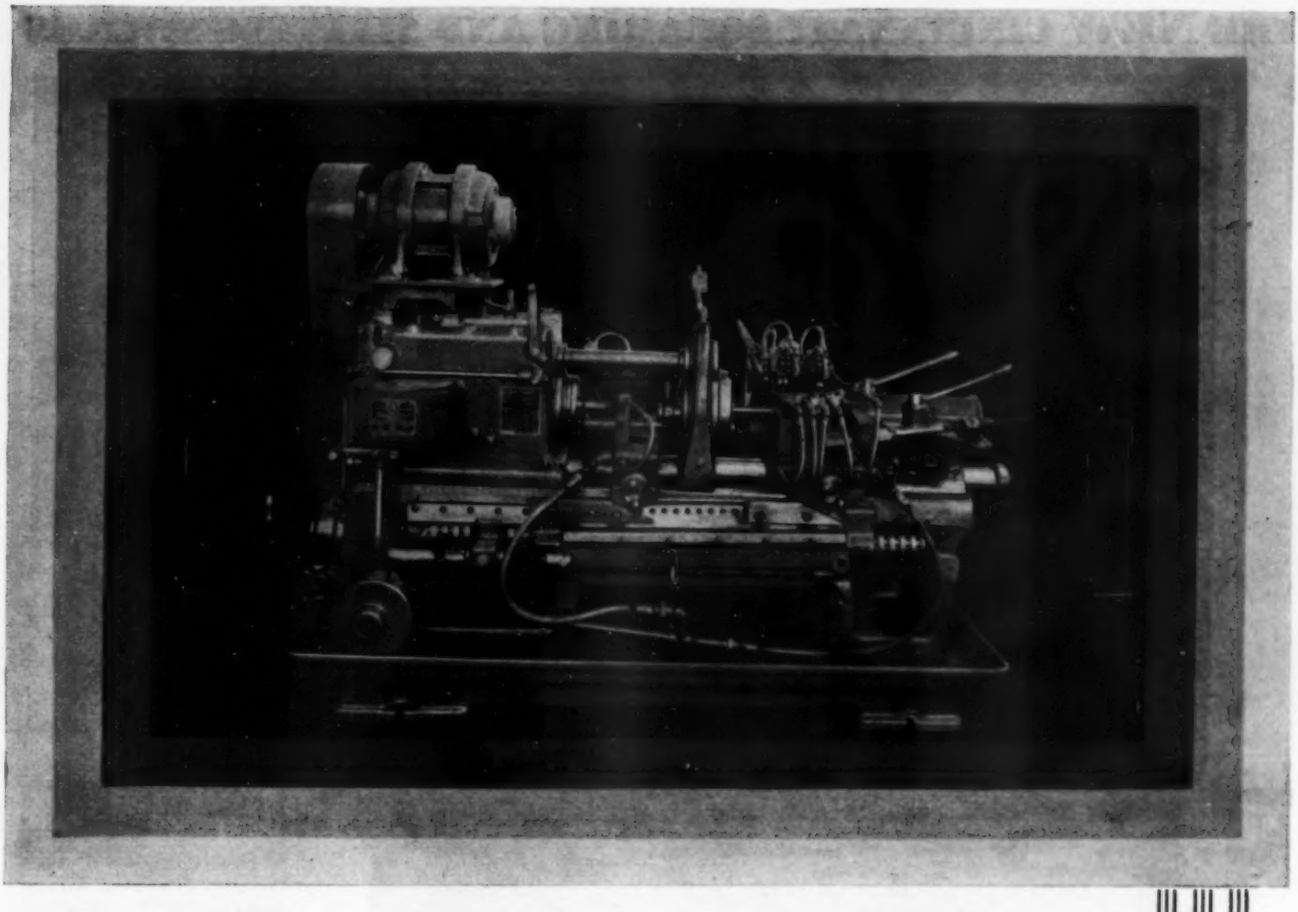


for

L O N G

or

SHORT RUNS

This snappy little machine is showing the trade something new

IN PRODUCTION

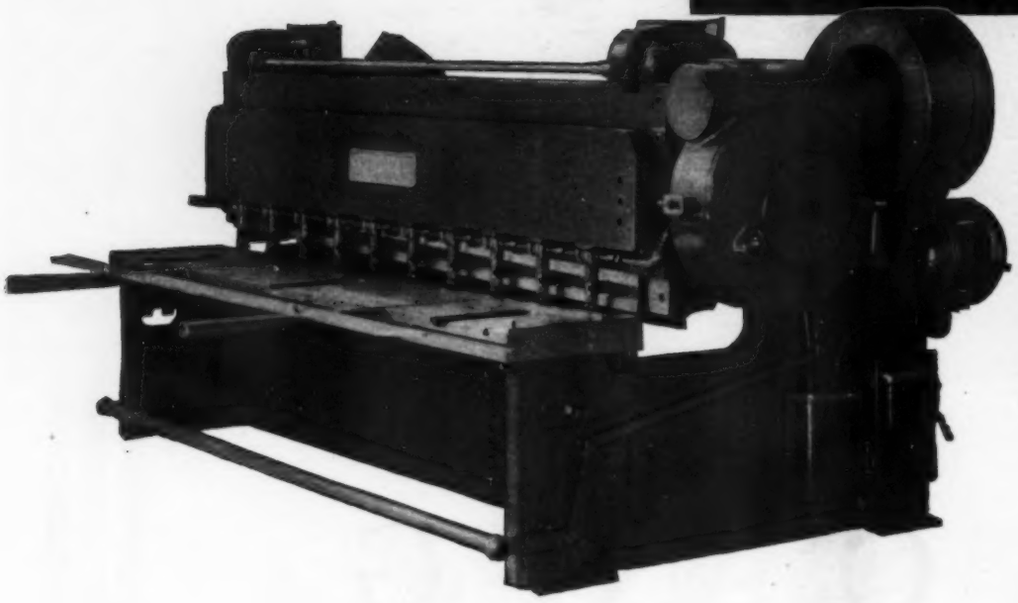
J&L
JONES & LAMSON

MACHINE COMPANY

VERMONT, U. S. A.

THE NEW CINCINNATI SQUARING AND SLITTING SHEARS

EQUIPPED WITH G-E MOTORS and CONTROL



The New Cincinnati squaring and slitting shear, designed to operate as fast as 60 strokes per minute, and "Equipped with G-E Motors and Control" for efficiency and dependability

GENERAL ELECTRIC motors and control operate the new squaring and slitting shears recently announced by the Cincinnati Shaper Company.

Here again, General Electric coöperated closely in selecting exactly the right motor and right control to power these new tools correctly.

Insist that your machine tools be "Equipped with G-E Motors and Control". Their worth is accurately measured by the confidence everywhere expressed by leading machine-tool designers and builders.

JOIN THE "G-E CIRCLE"—SUNDAYS AT 5:30 P. M. E. S. T. ON N. B. C. NETWORK OF 54 STATIONS—WEEK-DAYS (EXCEPT SATURDAY) AT NOON

200-549

GENERAL ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

An "AMERICAN" *excels here*

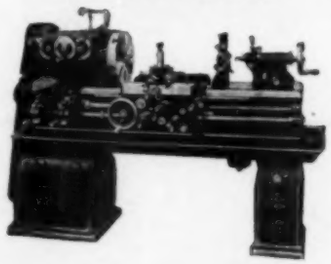
IN the final analysis it's performance that determines which machine will be selected for a given job.

The installation illustrated is typical of what is happening in hundreds of shops where "American" performance records are studied.

This 42" Super-Productive Lathe is being used to produce parts for Diesel Engines by a prominent Diesel manufacturer.

Power to drive special alloy tools, speed to boost production to its most economical point and rigidity that insures constant accuracy and freedom from breakdowns are a few of the reasons for this "American" excelling on this job. They are also reasons why you should investigate "Americans" for your work.

LATHES
RADIALS
SHAPERS



THE AMERICAN TOOL WORKS CO.

CINCINNATI, U. S. A.

PROFITS FROM FGS in the NORTON COMPANY plant

as reported in the prize winning article in Nov. 12th issue

PROFITS FROM FGS in the WARNER & SWASEY plant

as reported in the prize winning article in Dec. 3rd issue

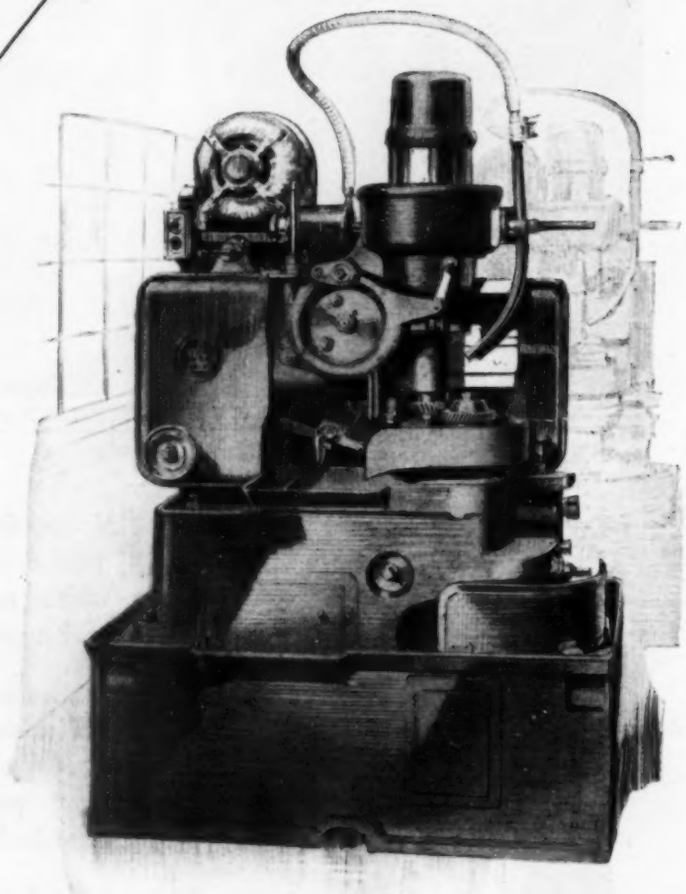
PROFITS FROM FGS at PITTSBURGH GEAR & MACHINE COMPANY plant

as reported in the prize winning article in Dec. 10th issue

PROFITS FROM FGS in the ROTOR AIR TOOL plant

as reported in the prize winning article in Dec. 24th issue

FOUR POINTS of VIEW

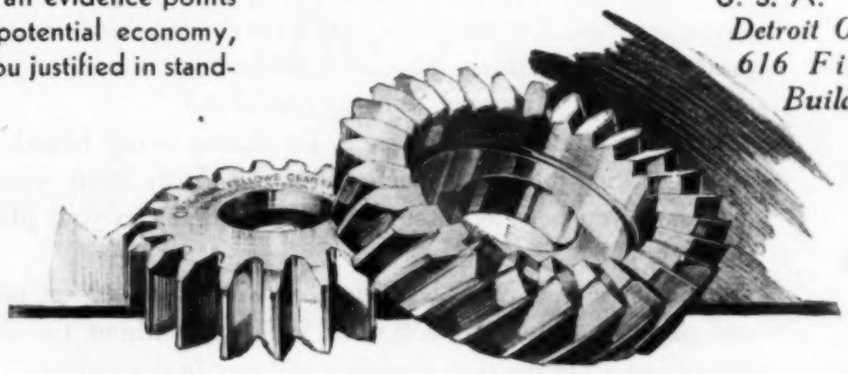


The trend toward HELICAL GEARS makes Fellows Methods more-than-ever important in producing a modernized product.

~ ~ and one Common Conclusion

You have read the candid opinions of those who have measured the high accuracy, high economy and versatile application of the modern "High Speed" Gear Shaper — more impartially expressed than any advertisement we could publish. **Gear Shaper Methods are a vital production economy in today's competitive strife.**

Your own gear costs deserve searching scrutiny. What are your inspection losses or rejected assemblies? Would the over-all saving not be greater if you generated your gears. Surely your product needs the competitive advantage of high-accuracy gears. Today — more than ever before! And, when all evidence points to a potential economy, are you justified in standing pat on out-moded production methods? Are you, or are you not, cutting gears cheaply? A frank discussion with a Fellows Sales Engineer may develop interesting conclusions. No obligation, of course. Write THE FELLOWS GEAR SHAPER COMPANY, Springfield, Vermont, U. S. A. (*or Detroit Office, 616 Fisher Building*).



FELLOWS
~ GEAR SHAPER ~
METHODS

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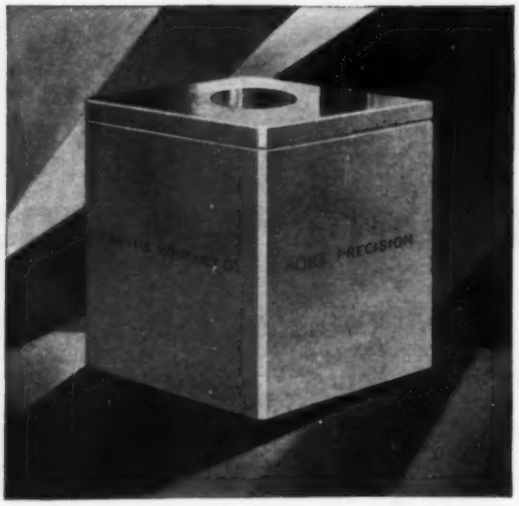
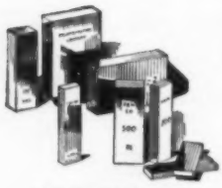
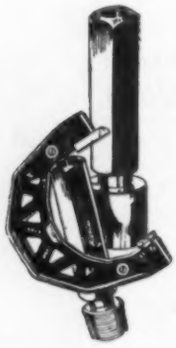


Look *through* this gage!



USA BLOCKS



P & W GAGES

DO not think of it solely as a block of metal accurate to millionths of an inch. It means much more than that to everybody vitally interested in the metal-working industry.

It is the symbol of the future — a high standard for which the man working to thousandths of an inch can find a practical use as well as the inspiration to do better work.

Greater accuracy, finer finish, refinements in precision are no longer luxuries. The man who buys a car or a machine or any metal product demands them. So that manufacturers are faced with the stern fact that "Accuracy" *must* be considered.

Pratt & Whitney makes gages for almost every branch of the metal-working industry. Our experts will gladly study your needs and show you how to obtain low-cost accuracy in your plant and product.

Send for a P & W Sales Engineer who is an expert on gages and gaging systems. He will work with you without the slightest obligation, to prove that accuracy will pay in your plant.

PRATT & WHITNEY CO.

Sales Offices and Stock at: BIRMINGHAM BOSTON CHICAGO CINCINNATI CLEVELAND DETROIT

ACCURACY

By this sign . .

THIS monogram has become an international sign for "Accuracy" not only in measuring but in production.

Pratt & Whitney small tools—taps, dies, etc.—are accurate in themselves, but they also produce accuracy at the lowest cost for the longest time. They are made so much better that the initial accuracy is preserved for a surprising number of working hours or while they are producing a large number of pieces.

The steel is treated by special P & W methods to give the required hardness and toughness that resist wear. The designs of P & W Small Tools are born of long experience and facilities to test and prove every detail of design and construction.

We invite you to place the problem of accuracy in your plant and products in our hands. With our resources and knowledge and your specific information about your products the way to accuracy should be clear.

And "Accuracy" is the highway to the sales and profits of tomorrow. Write to us.

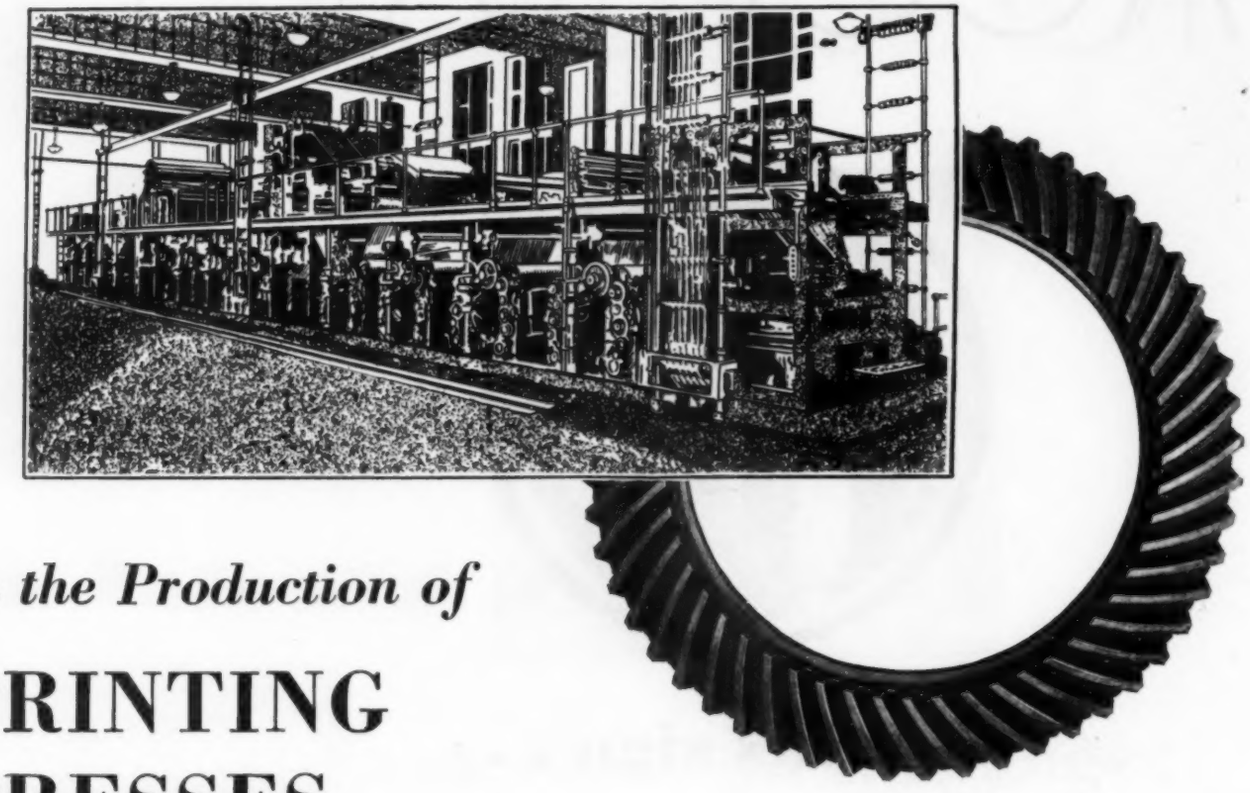
HOKE BLOCKS

SEND FOR A COPY OF THIS CIRCULAR

HARTFORD, CONN.

LOS ANGELES NEW YORK PHILADELPHIA PITTSBURGH ROCHESTER SAN FRANCISCO ST. LOUIS

Gleason's Service to Modern Industry



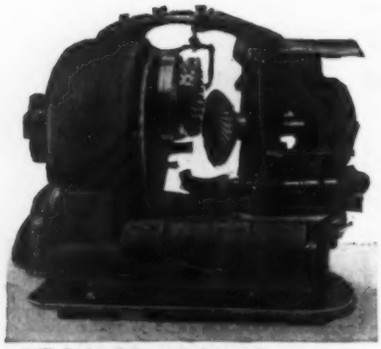
In the Production of

PRINTING PRESSES

BEVEL Gears play an important part in the operation of the huge presses on which our daily newspapers and our magazines are printed. The quiet, continuous, trouble-free service given by these gears makes one almost unaware of their presence, but they form a main connecting link between the motor and the various units.

Both Spiral and Straight Bevels are used in this type of machinery. Spiral Bevels are recommended in all cases where the peripheral speed of the gears exceeds 1200 feet per minute. They are exceptionally quiet and smooth in operation due to the overlapping action and continuous pitch line contact of the circular teeth. If Straight Bevels are used, they should be correctly generated on Gleason Bevel Gear Generators.

Gleason Spiral Bevel Gear Generators are built in several sizes for cutting gears from 3/8 in. to 90 in. pitch diameter. Gears up to about 30 in. pitch diameter are cut on machines employing a circular cutter. They generate the correct tooth profile by rolling the work and cutter together as though they were finished gears in mesh. These machines are fully universal and produce work of the highest quality.



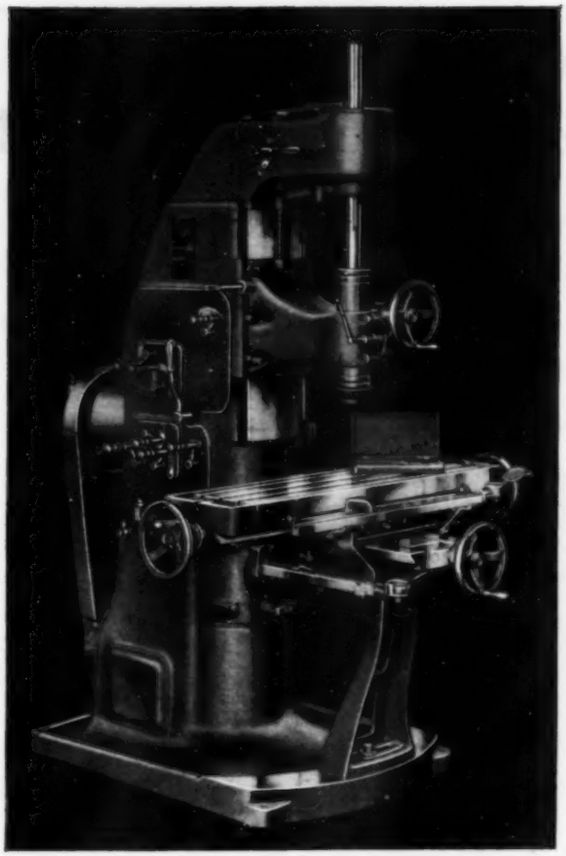
25" Spiral Bevel Gear Generator

Complete information is available.

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Sixty Years

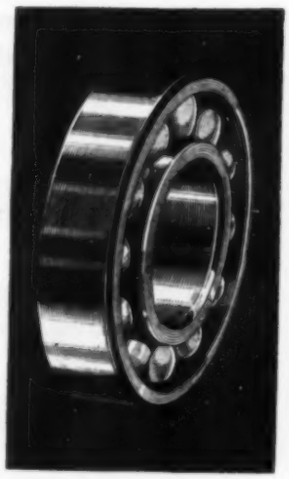
1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.



A number 4 Knight miller, equipped with 7 New Departures. Built by the W. B. Knight Machinery Co., St. Louis.

Bearings that do all things well

One feature of the Knight No. 4 Vertical Miller, which owners particularly like, is the number of operations it can perform so well. Versatility. Wherever this quality is desired, there is need for New Departure Ball Bearings. Versatility requires speed. And no one will deny the speed ability of New Departures. Versatility requires accuracy and smoothness, two qualities inseparable, one from another in New Departures. Versatility is also enhanced by three other New Departure characteristics — rigidity — care-freedom — durability. Whatever kind of a machine you build, it can have all these performance advantages — just specify New Departures. The New Departure Manufacturing Company, Bristol, Connecticut; Detroit, Chicago, San Francisco, and London, Eng.

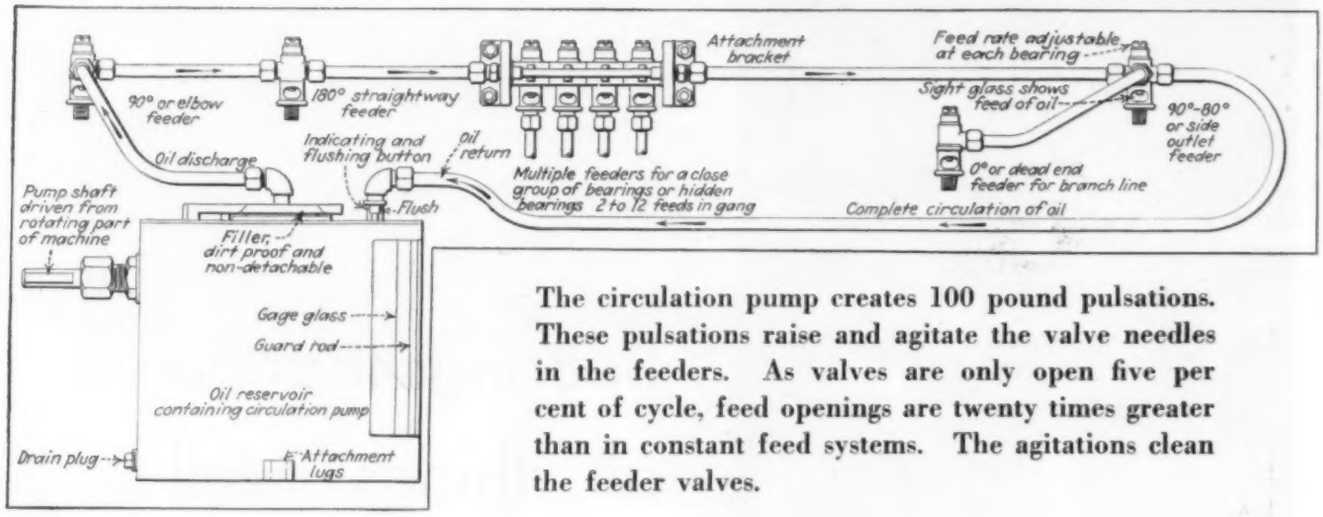


1828

NEW DEPARTURE BALL BEARINGS

Fully Automatic Oil Lubrication

BLANCHARD PULSATING SYSTEM


90° or elbow feeder
180° straightway feeder
Attachment bracket
Feed rate adjustable at each bearing
Sight glass shows feed of oil
90°-80° or side outlet feeder
Oil discharge
Indicating and flushing button
Oil return
Multiple feeders for a close group of bearings or hidden bearings 2 to 12 feeds in gang
0° or dead end feeder for branch line
Complete circulation of oil
Pump shaft driven from rotating part of machine
Flush
Filler, dirt proof and non-detachable
Gage glass
Guard rod
Oil reservoir containing circulation pump
Drain plug
Attachment lugs

The circulation pump creates 100 pound pulsations. These pulsations raise and agitate the valve needles in the feeders. As valves are only open five per cent of cycle, feed openings are twenty times greater than in constant feed systems. The agitations clean the feeder valves.

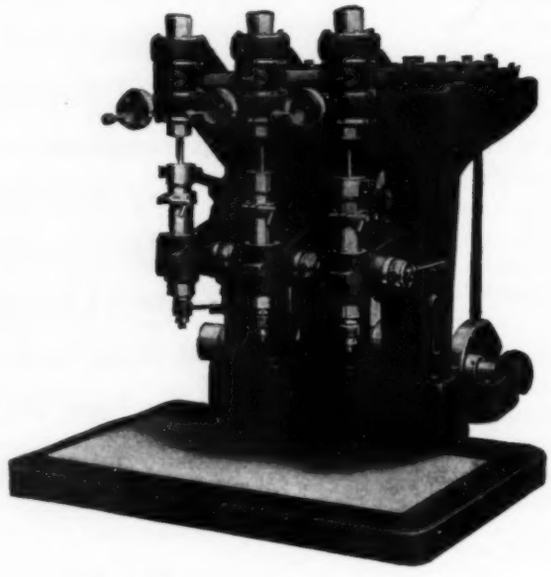
Complete Bulletins B-1, B-2 and B-3 on request

Lubrication Division

RIVETT LATHE AND GRINDER CORPORATION

Brooks St. and Riverview, Brighton, Boston, Mass., U. S. A.

If it's High Speed— Sensitive Drilling *call on* Avey



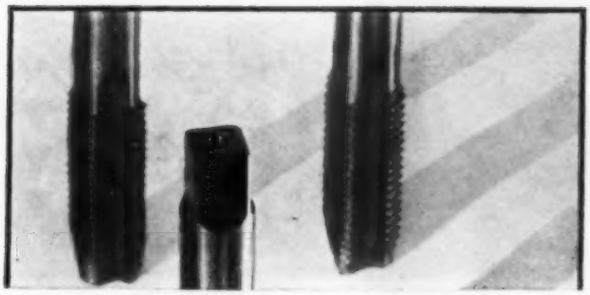
Sturdy, compact, fast—this in a few words describes the Avey Sensitive Drilling Machine. The Bench type illustrated is only one of many different types built to meet your needs.

Any number of spindles up to six, bench or column type, hand or automatic control or a combination of both—in fact Avey will meet your sensitive drilling problem with equipment that produces economically and that requires less maintenance.

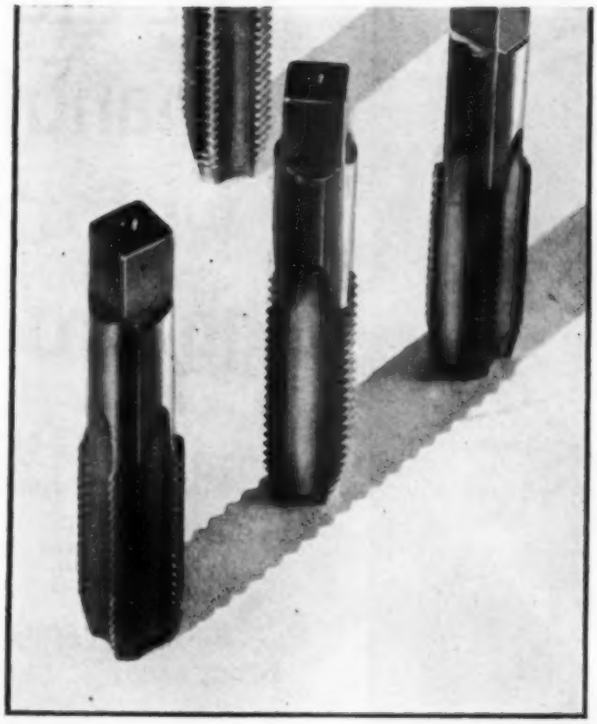
If it's High Speed—Sensitive Drilling it will pay you to call on Avey.

AVEY Drilling Machine Co.

Cincinnati, Ohio



Your 1932 Shop Demands 1932 TAPS



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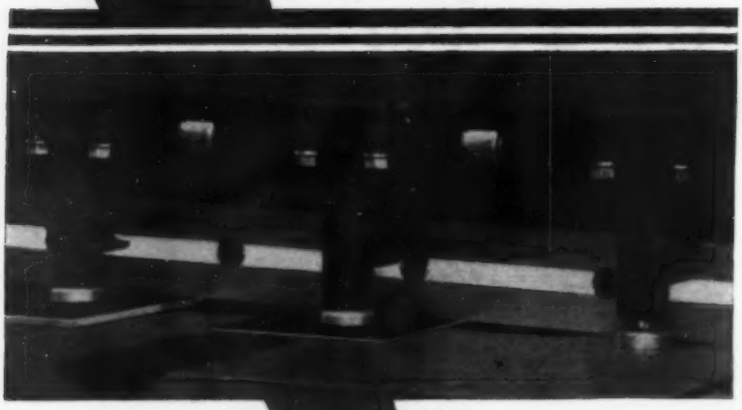

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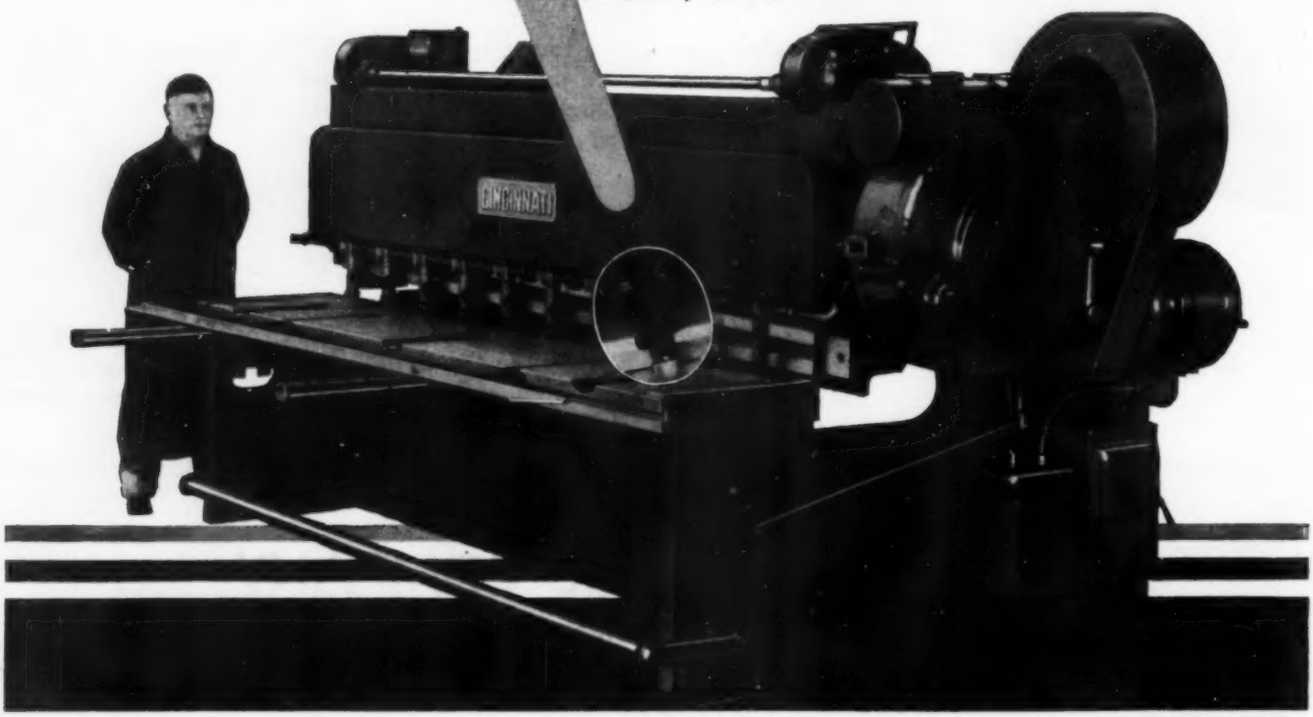
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